MANITOBA CANADA CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

Energy, Mines and Resources Canada

Énergie, Mines et Ressources Canada

Manitoba Energy and Mines

PREPARED BY:
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WINNIPEG, MANITOBA

ENERGY DEMO

HOME ENERGY SAVING DEMONSTRATION PROGRAM

(APPENDICES)

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MANITOBA/CANADA CONSERVATION AND RENEWABLE ENERGY DEMONSTRATION AGREEMENT

The availability of secure and affordable energy supplies is a subject of national concern. It is an accepted fact that our primary energy sources — oil and natural gas — are becoming less accessible and more costly. However, Canada is well-endowed with renewable and alternative resources that can provide a bridge into the future.

To this end, the governments of Manitoba and Canada entered into a Conservation and Renewable Energy Demonstration Agreement which was signed May 9, 1980 and terminated March 31, 1984. The Agreement was dedicated to the development and demonstration of conservation and renewable energy technologies. Equally cost-shared by the provincial and federal governments, the program had a total budget of $18-million.

The objectives of CREDA are:

- To develop and demonstrate promising new technologies, which, when widely adopted, will exploit renewable resources, conserve energy and/or use energy more efficiently.
- To develop broad public awareness of the potential of renewable energy and conservation technology.
- To provide opportunities for the commercial application of the technologies within Manitoba.
- To create economic spin-off benefits for manufacturing, industry and commerce.
- To create employment in new or existing energy-related industries.

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APPENDIX A

ENERGY DEMO APPLICATION FORM

Energy Demo.

A.1

Energy Demo — the Home Energy Saving Demonstration — is a special, but limited, federal-provincial project to show homeowners how they can reduce their use of energy and save money.

Energy Demo will show Manitobans how to "retrofit" their homes so that they use less energy and spend fewer dollars on natural gas, oil, propane and electricity.

There are many ways to make changes and improvements to a house so that less energy is used. This is known as "retrofitting."

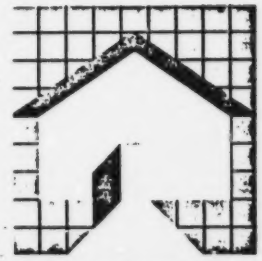
Energy Demo will show how home energy costs can be cut by at least 40 per cent.

To find the most cost-effective method of reducing energy use in a wide variety of homes across the province, Energy Demo needs 120 Manitoba homeowners willing to participate in its demonstration — the first of its kind in Canada.

Since no two houses are exactly the same — some older, some more soundly constructed and some more energy-efficient — Energy Demo is looking for a cross-section of housing with a wide variety of retrofitting alternatives to showcase in its demonstration.

Homeowners prepared to take part must be willing to invest some of their own money, assist in collecting information and open their home to the public.

To ensure a full range of cost-effective retrofits, Energy Demo will



make tax free contributionsof up to $5,000 to 120 successful applicants. Participating homeowners will have to match Energy Demo funds so that total retrofitting costs will be in the $2,000 and $10,000 range.

Energy Demo is a project cost-shared under the terms of the Manitoba/Canada Conservation and Renewable Energy Demonstration Agreement. The project is sponsored by the provincial department of Energy and Mines and federal department of Energy, Mines and Resources.

ELIGIBILITY REQUIREMENTS

- The home must be the principal residence of the owner.
- The home must have been constructed before December 31, 1970.
- The current market value of the home cannot exceed $64,000. (A bill of sale, mortgage appraisal, or appraisal certificate done within the past two years is acceptable verification. If none of these are available, Energy Demo will undertake an appraisal).
- The home must be a single detached family dwelling.
- The total retrofit cost must be at least $2,000, but not greater than $10,000.
- The proposed retrofit must reduce energy consumption by at least 40%, an energy audit will verify the proposed reductions.
- The homeowner must agree to permit pre-arranged public visits to their home on at least three occasions over a two-year period.
- Completed applications must be received before February 18, 1983.

PARTICIPANTS RESPONSIBILITIES

- Successful applicants will be responsible for one-half of the total retrofit cost to a maximum of $5,000.
- The retrofit must not be started until the successful applicant is formally notified and a contract is signed.
- Work or retrofit measures undertaken before formal notification are not eligible for funding under this demonstration.
- The retrofit must be completed by November 1, 1983.
- The home must be occupied by the owner for at least two years after the retrofit is completed – subject to conditions beyond the homeowner's control.
- The successful applicant must sign a contract agreeing to comply with all Energy Demo specifications, pay the balance of costs not covered by government funds and give permission for all energy costs to be monitored for a two-year period after completion of the retrofit.
- The successful applicant is responsible for ensuring the retrofit complies with all local, provincial and federal building codes, regulations and standards.
- The homeowner is responsible for obtaining competitive quotations from reputable contractors. It is strongly recommended that at least two quotations be obtained for work that is to be contracted out. A copy of the quotation(s) that the homeowner intends using for the retrofit must accompany the application.
- Energy Demo reserves the right to ensure that quotes are reasonable and may require additional quotations.
- Acceptance of the homeowner's choice of contractors by Energy Demo does not mean Energy Demo assumes any responsibility for the quality of the contractors workmanship. The homeowner will be responsible for the supervision of the work.
- Site inspections by Energy Demo officials, should not be considered as construction supervision.
- If the homeowner intends to do a portion of the labor, details must be provided with the proposal; however, labor charges by the homeowner will not be paid for under Energy Demo.

WHAT TYPE OF WORK IS NOT ELIGIBLE?

- The removal of insulation.
- Construction for cosmetic, rehabilitation or structural purposes.

RETROFIT OPTIONS

Under the terms of Energy Demo, the retrofit must reduce energy consumption by a minimum of 40 per cent. A variety of combinations of retrofit measures can achieve this objective.

The following retrofit suggestions have been provided to illustrate some of the options available and are not intended to be all inclusive. Your retrofit proposal must be individually developed to suit the needs of your home and your family.

The contractor you select should be able to assist you in developing retrofit options best suited to your home.

OPTIONS	APPROXIMATE COSTS (for 1,000 sq. ft. bungalow)
Doors and Windows	
Caulk and weatherstrip (installed)	$50 to $750
Replace windows – double glazing on south; add additional glazing; triple glazing on all other orientations	$350 and up for new triple-glazed unit installed.
Install insulating shutters	$5-$10 per sq. ft. Range of prices depending on type of insulation.
New insulated doors (installed)	$300 to $500 each
Installation of an air lock (double door entrance system)	Starting at $250 labor and materials for installation of a door. Framing and finishing extra.
Insulation	
Seal and insulate basement (complete with gypsum wallboard)	Starting at $1,500 (R-20 or RSI-3.5 to R-28 or RSI-4.9 recommended)
Seal and insulate attic	Starting at $500 adding R-20 or RSI-3.5, plus labor.
Seal and insulate walls (includes siding) rigid insulation	Starting at $4,000-R-20 or RSI-3.5.
Insulate hot water tank and pipes	$50 to $100
Double wall retrofit	$7,000 to $8,000
Insulate, rebuild roof for cathedral ceiling	$1,500 to 2,000
Lighting	
Remove all ceiling fixtures	Site specific
Install fluorescent lighting	Site specific
Install dimmer switches (4 switches plus labor)	$50
Mechanical	
Install night setback thermostat or timers	$100 to $150
Replace fireplaces (i.e. wood stoves), new dampers, glass doors, outside venting, forced air system.	Site specific
Upgrade or change heating system.	Site specific
Installation of energy system – heat pump, hot water storage.	Dependent upon system selected
Hot water flow restrictors on showers, faucets, etc.	Site specific

The following table has been provided to give you an idea of what various retrofit options will cost, and what savings they can yield. REMEMBER – TO QUALIFY FOR ENERGY DEMO, YOUR RETROFIT MUST REDUCE YOUR ENERGY CONSUMPTION BY 40%.

OVERALL ESTIMATED COSTS AND SAVINGS (Labor included)
(1,000 sq. ft. bungalow)

Construction Technique	Estimated Costs	Estimated Savings of Total Energy Bill
Caulk and sealing	$ 500-$1500	10% to 20%
Windows (replacement)	$ 150-$5000	up to 12%
Basements (sealed and insulated)	$1500-$3000	10% to 25%
Attic (Add R-20)	$ 500-$ 600	10% and up
Single wall retrofit	$4000-$5000	40% and up
Double wall retrofit	$7000-$8000	50% and up
Install new heating system	$1500-$4000	20% and up

These are not necessarily cumulative savings.

OTHER LOAN AND GRANT PROGRAMS

The Energy Demo has been designed to work in conjunction with CHIP (Canadian Home Insulation Program), COSP (Canadian Oil Substitution Program) and HILP (Home Insulation Loan Program).

- If you are eligible for CHIP, under the terms of the demonstration, you should apply for a CHIP grant.
- If oil is your primary heating source and you are proposing to convert your heating system under the demonstration – you should apply for the COSP grant.
- HILP provides a low-interest loan (to a maximum of $1,000) which may assist in funding your portion of the demonstration.
- Using more than one government-sponsored program to pay for the same work will not be permitted.

NOTE: There are a number of Federal and Provincial Assistance programs available to homeowners undertaking renovations. Energy Demo will NOT provide funds for work paid for by these other programs.

	CHIP CANADIAN HOME INSULATION PROGRAM	COSP CANADIAN OIL SUBSTITUTION PROGRAM	HILP HOME INSULATION LOAN PROGRAM
Funded by	Gov't of Canada	Gov't of Canada	Gov't of Manitoba
Applicant Eligibility	• Home have been built before Jan. 1/71 • Home must be principal residence of the owner • If you are eligible for CHIP – under the demonstration, you should apply for a CHIP grant.	• Oil must be primary home heating source • Conversion from oil to another primary heating source must be on or after Oct. 28/80 • If replacing an oil heating system under the demonstration – you should use COSP	• Loans are available to all homeowners • Must first use CHIP if eligible.
Eligible Work	• Weatherstripping and caulking • Insulation and vapour barrier material	• To convert from oil as primary heating source to any other heating source, including natural gas, electricity, wood, solar or propane.	• Purchase and installation approved insulation materials – storm windows and doors, materials used directly for vapour barriers, framing, ventilation and weather-stripping.
Maximum Funding Available	• Grant to cover 60% of materials and labor to a maximum of $500.	• Grant covers 50% of materials, equipment and labor to a maximum of $800.	• Maximum loan of $1000/home • Current interest rate -9½% • Minimum monthly payment of $9.33 for 20 years. (or multiples for shorter periods) • Payable in one lump sum with no penalty • Payable over 20 years
For Further Information	CHIP 870 Portage Avenue Winnipeg, Manitoba. R3G 0P2 942-2471 1-800-362-3346	Energy, Mines and Resources Canada 112 Osborne Street S Winnipeg, Manitoba R3L 1Y5 949-4266 1-800-542-8928	Hydro that services you: Manitoba Hydro 474-3940 Winnipeg Hydro 946-0529

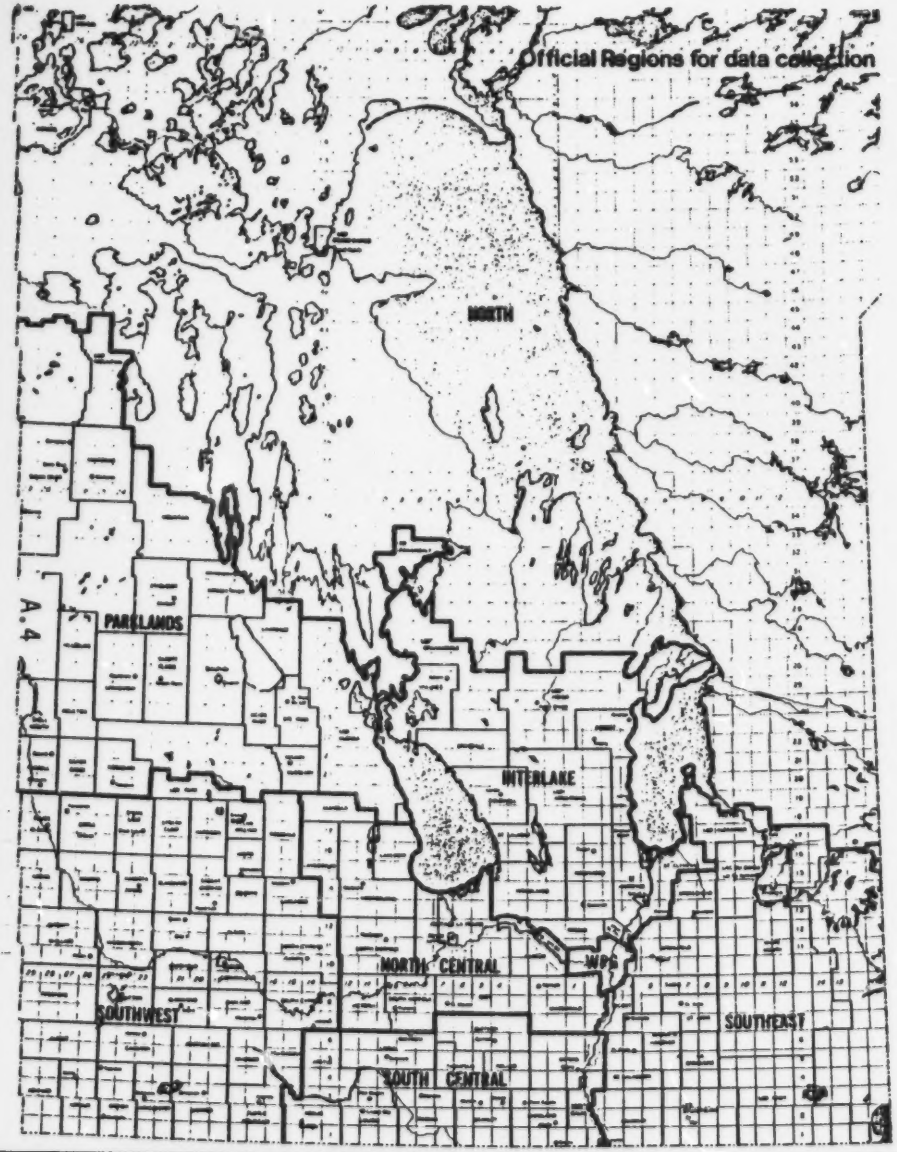
On the application form, when calculating your retrofit costs, indicate all additional loans and grants for which you will be applying.

For example:

1) Total Retrofit Cost	$2,000
Energy Demo Grant (50%)	1,000
Homeowner's share (50%)	1,000
2) Total Retrofit Cost	$2,000
CHIP Grant	500
COSP Grant	600
Balance	900
Energy Demo Grant (50%)	$ 450
Homeowner's share (50%)	450
3) Total Retrofit Cost	$5,000
CHIP Grant	500
COSP Grant	800
Balance	3,700
Energy Demo Grant (50%)	$1,850
Homeowner's share (50%)	$1,850
4) Total Retrofit Cost	$10,000
CHIP Grant	500
Balance	9,500
Energy Demo Grant (50%)	$ 4,750
Homeowner's share (50%)	4,750

The homeowner, if eligible, may borrow up to $1,000 under the Department of Energy and Mines Homeowner's Insulation Loan Program (HILP) to cover his or her share of the total retrofit cost.

NOTE: If you are planning to do any additional work on your home at the same time as retrofitting, it must be indicated on the application form. If the homeowner is applying for any funding or assistance for any other program, it must also be indicated on the application form.



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FUNDING DISTRIBUTION

To ensure equitable distribution of Energy Demo funds, Manitoba has been divided into eight regions. Grants will be allocated on the basis of regional population, as follows:

Southeast	8
Interlake	7
North Central	5
South Central	5
Southwest	12
Parklands	6
North	11
Winnipeg	66
TOTAL	120

If available funds in a region go unclaimed these will be re-allocated at the discretion of Energy Demo.

SELECTION CRITERIA

APPLICATIONS WILL BE REVIEWED AND PROCESSED IN THE ORDER IN WHICH THEY ARE RECEIVED AT THE ENERGY INFORMATION CENTRE. However, time of application submission is not the only criteria which will be used in the final selection. Consideration will be given to:

LOCATION OF HOME — A limited number of contributions will be awarded for each of the eight regions in the province. See section entitled 'FUNDING DISTRIBUTION'.

COST-EFFECTIVENESS — For demonstration purposes, homes will be selected to represent a full range of the retrofit options available. Cost-effectiveness will be a major factor under consideration.

AGE OF THE HOME — Homes will be selected from each of the three age groups as noted in Question #2, in the application form.

TYPE AND SIZE — To ensure a representative cross-section of Manitoba homes – homes will be selected from each of the various types and sizes, as noted in Questions #3, #4 and #12 in the application form.

JOB CREATION — Do-it-yourself retrofits will be allowed but to preserve the job creation element of Energy Demo the number of these will be limited.

Where all other criteria are satisfied, selection will be by draw.

PROGRAM PROCEDURES

1. Applicant Selection

- based on the selection criteria, the Energy Demo coordinator will select the 120 retrofit demonstrations.
- an energy audit will be conducted by Energy Demo on each of the 120 selected homes.
- during the audit, heat loss and potential energy savings will be calculated.
- under the terms of the demonstration, the retrofit must reduce energy consumption by at least 40% and result in a total energy use of not more than 250 kW/h per square meter – this will be assessed at the audit.
- if the proposed retrofit as assessed by the audit falls short of the demonstration requirements, the applicant will have the choice of revising the proposal.
- if the applicant fails to revise the proposal incorporating additional requirements, another application will be selected.
- this procedure will continue until all 120 applicants have been chosen and approved.
- an infiltration test will then be conducted on the 120 selected homes.
- all successful applicants will be advised in writing.

The Retrofit Period

- after the applicant has received approval of the proposed retrofit measures and the contract has been signed, construction can begin immediately.
- upon proof-of-purchase of materials, the applicant will be advanced 50% of the agreed retrofit contribution.
- during construction, the Energy Demo coordinator will make periodic site visits to monitor the progress and methods of construction. (Site inspections by the coordinator should not be considered as construction supervision).

3. Completion of the Retrofit

- the retrofit must be completed by November 1, 1983.
- upon notification of completion, the Energy Demo coordinator will inspect the retrofit, and verify all work has been completed.
- an infiltration test will be conducted at the conclusion of the retrofit – further minor sealing might be required as a result of this test.
- upon receipt of a declaration by the homeowner that all retrofit work has been completed as per the contract and all outstanding bills for labor and materials have been paid, the demonstration coordinator will initiate final payment of the Energy Demo contributions.
- if the retrofit is not completed on time, the homeowner will be responsible for repayment of the initial accountable advance, unless the homeowner can satisfy the coordinator that the situation is beyond the homeowner's control.
- Energy Demo may wish to organize public visits to the home on up to three occasions during and up to 24 months after construction. These visits would be arranged at mutually agreeable times and will not exceed more than four hours on each occasion.

4. Monitoring

- the monitoring period will begin immediately after construction is complete and will continue for a period of 24 months.
- homeowners will be required to allow monitoring of all utility bills for a two-year period following completion of construction.

APPLICATION PROCEDURES

Complete the attached form and forward it to:

Energy Demo.
Energy Information Centre
500 Portage Avenue
Winnipeg, Manitoba
R3C 0V8

Telephone Winnipeg – 944-4154
Toll-Free in Manitoba – 1-800-282-8069

ALL applications must be received at the Energy Information Centre no later than 4:30 p.m. FRIDAY, FEBRUARY 18, 1983

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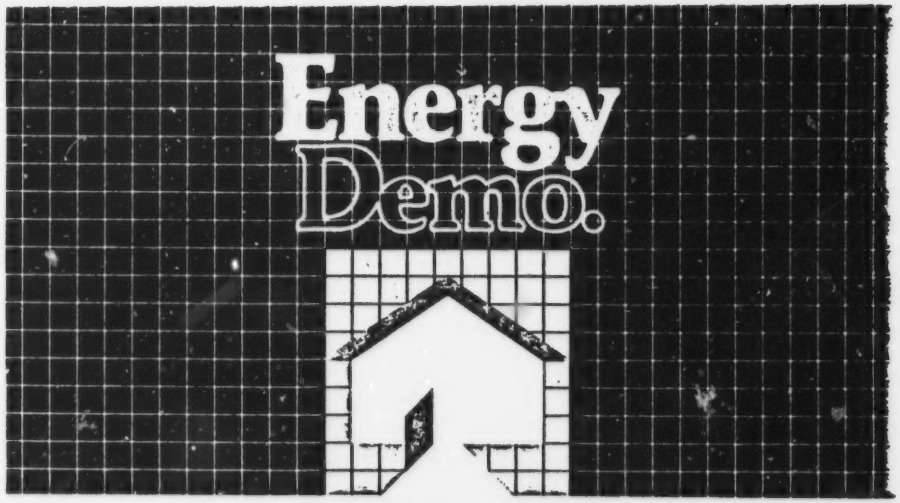


Application Form

Please return completed application form to:

Energy Demo.
Energy Information Centre,
500 Portage Avenue,
Winnipeg, Manitoba R3C 0V8

(PLEASE PRINT)

NAME _____
SURNAME FIRST NAME

ADDRESS _____

CITY/TOWN _____ MANITOBA

POSTAL CODE _____ REGION _____
(SEE MAP IN GUIDELINES)

HOME TELEPHONE _____ WORK TELEPHONE _____

1. What is the current market value of your Home?
(please attach a copy of the bill of sale, mortgage appraisal or real estate certificate – if appraised within the past two years).

_____
maximum allowable $64,000

OR

☐ I require an appraisal.

2. When was your home build?

1 ☐ before 1945
2 ☐ 1945-1960
3 ☐ 1961-1970

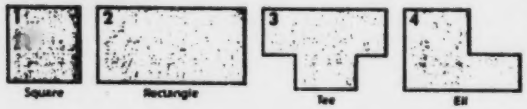
3. How many storeys does your home have?

If your home has an addition or extension, indicate the number of storeys in the main structure. A basement or crawl space should not be considered as a storey.

1 ☐ one storey
2 ☐ one & half storey
3 ☐ two storey
4 ☐ two & half storey
5 ☐ three storey
6 ☐ split level
7 ☐ split entry

4. What is the basic shape of the ground floor of your home?

Disregard any unheated porches, garages, sheds, etc. and any small irregularities in shape.



1 ☐ square
2 ☐ rectangle
3 ☐ tee
4 ☐ ell
5 ☐ other

5. What is the total distance (i.e. perimeter) around the ground floor of your home?

This distance should be measured on the outside of your home, as in this example. Disregard unheated porches and garages.

1 ☐ less than 25 m (less than 82 ft.)
2 ☐ 25 to 30 m (82 to 101 ft.)
3 ☐ 31 to 36 m (102 to 121 ft.)
4 ☐ 37 to 42 m (122 to 141 ft.)
5 ☐ 43 to 48 m (142 to 161 ft.)
6 ☐ 49 to 54 m (162 to 181 ft.)
7 ☐ 55 to 60 m (182 to 201 ft.)
8 ☐ 61 to 66 m (202 to 220 ft.)
9 ☐ more than 66 m (more than 220 ft.)

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6. If your home has more than one storey, what is the total distance (i.e. perimeter) around the floor of the uppermost storey?

This distance should be measured on the inside of your home. For the purposes of this question, the upper part of a split level would be the uppermost storey.

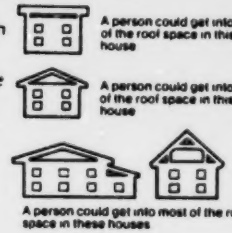
1 ☐ one storey only
2 ☐ less than 25 m (less than 82 ft.)
3 ☐ 25 to 30 m (82 to 101 ft.)
4 ☐ 31 to 36 m (102 to 121 ft.)
5 ☐ 37 to 42 m (122 to 141 ft.)
6 ☐ 43 to 48 m (142 to 161 ft.)
7 ☐ 49 to 54 m (162 to 181 ft.)
8 ☐ 55 to 60 m (182 to 201 ft.)
9 ☐ 61 to 66 m (202 to 220 ft.)
10 ☐ more than 66 m (more than 220 ft.)

7. ROOF

How much of your total roof space is an attic?

An attic here refers to any part of your roof space that is large enough for a person to get into so that it would be possible to insulate.

Roof space refers to the space between the ceiling and roof of your home. Do not include roof space over unheated areas.


A person could get into none of the roof space in this house
A person could get into all of the roof space in this house
A person could get into most of the roof space in these houses

1 ☐ none of the roof space
2 ☐ some (about ¼)
3 ☐ half
4 ☐ most (about ¾)
5 ☐ all

8. If you identified an attic space in Question 7, how much insulation does it contain?

1 ☐ no attic space identified
2 ☐ no insulation
3 ☐ about 5 cm (2 in.)
4 ☐ about 10 cm (4 in.)
5 ☐ about 15 cm (6 in.)
6 ☐ 20 cm or more (8 in. or more)

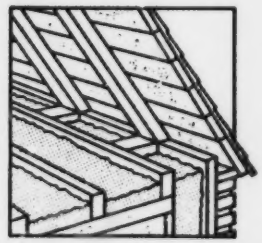
9. If not all of your roof space is an attic, does the remaining roof space contain any insulation.

1 ☐ no remaining roof space
2 ☐ yes
3 ☐ no
4 ☐ don't know

10. How are your exterior walls constructed?

Most Canadian houses are wood frame. Before indicating that your wall construction is solid masonry or stone, make certain that the walls are not actually built with a wood frame.

If you are not certain about the construction of your walls, you may be able to find out by removing the cover on a light switch or an outlet box. In some houses, you can also see into the wall space from the attic.



The exterior walls of this house are built with wood frame construction.

1 ☐ wood frame (with any cover including brick, stucco, or various sidings)
2 ☐ solid masonry or stone (with no wood frame)
3 ☐ plank frame or solid log

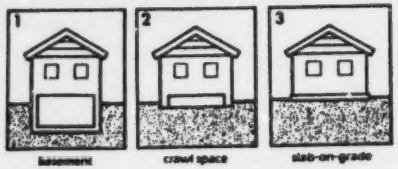
11. How much of the perimeter of your exterior wall contains at least some insulation?

Tar paper, felts, foils, boards or fibre board sheetings should not be considered as insulation.

To determine whether or not the walls are insulated, you may be able to inspect the walls from the attic, or by drilling a small hole into the back of a cupboard (the hole should be plugged after inspection). Wall insulation can also be checked by removing the covers on light switches or outlet boxes.

1 ☐ none of the perimeter
2 ☐ some (about ¼)
3 ☐ half
4 ☐ most (about ¾)
5 ☐ all

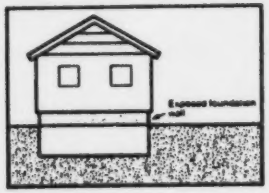
12. BASEMENT
What type of foundation do you have?



1 ☐ basement of cellar
2 ☐ crawl space
3 ☐ slab-on-grade

13. How much of your outside foundation wall is exposed above ground?

If the exposed height varies around the perimeter of the wall, specify the average distance.



1 ☐ none of the foundation wall
2 ☐ 15 cm or less (6 in. or less)
3 ☐ about 30 cm (1 ft.)
4 ☐ about 45 cm (1 ft. 6 in.)
5 ☐ about 60 cm (2 ft.)
6 ☐ about 90 cm (3 ft.)
7 ☐ 120 cm or more (4 ft. or more)

14. How much of the perimeter of your foundation wall is insulated either on the inside or the outside?

In this house, half of the perimter of the foundation wall is insulated.

1 ☐ none of the perimeter
2 ☐ some (about ¼)
3 ☐ half
4 ☐ most (about ¾)
5 ☐ all

A.7

15. How much of the floor of the heated area of your home is exposed to the outdoors or is over an unheated area?

The heated area should include any rooms that are not fully heated (i.e., kept much cooler than the rest of your home during the winter).

Do not include floor area over crawl spaces, cellars, basements of slabs-on-grade.

The exposed floor area could include an overhanging portion of a second storey, rooms over a carport, rooms over an unheated garage or porch, or a house or portion of it on stilts or blocks.

1 ☐ none of the floor
2 ☐ some (about ¼)
3 ☐ half
4 ☐ most (about ¾)
5 ☐ (all)

16. If you identified an exposed floor area in Question 15, what portion of it contains at least some insulation?

1 ☐ no exposed floor area
2 ☐ none of the exposed floor
3 ☐ some (about ¼)
4 ☐ half
5 ☐ most (about ¾)
6 ☐ all

17. WINDOWS AND DOORS

How many storm windows would you need to cover all windows which now have only one layer of glass in the wintertime.

Consider only those windows which separate the heated area of your home from the outdoors. For the purpose of this question, do not include small basement windows.

1 ☐ none
2 ☐ 5 or less
3 ☐ 6 to 10
4 ☐ 11 to 15
5 ☐ 16 to 20
6 ☐ 21 to 25
7 ☐ 26 to 30
8 ☐ 31 to 35
9 ☐ 36 to 40
10 ☐ over 40

18. Do any of your windows rattle or have drafts around them on windy days?

1 ☐ yes
2 ☐ no

19. How many doorways separate the heated area of your home from the outdoors or from unheated areas?

Patio doors should be included. Double doors should be considered as one doorway.

1 ☐ 1
2 ☐ 2
3 ☐ 3
4 ☐ 4
5 ☐ 5 or more

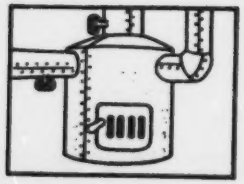
20. How many of these doorways are weatherstripped, have tight-fitting doors, or have storm doors so that there is no draft?

1 ☐ none of the doorways
2 ☐ some (about ¼)
3 ☐ half
4 ☐ most (about ¾)
5 ☐ all

21. FURNACE, THERMOSTAT & HOT WATER

What type of fuel is used to heat your home?

If you use more than one type, indicate the type which provides most of your fuel.



1 ☐ oil
2 ☐ electric
3 ☐ natural gas
4 ☐ propane
5 ☐ wood
6 ☐ coal
7 ☐ solar

22. How do you heat your water?

1 ☐ oil hot water heater
2 ☐ electric hot water heater
3 ☐ natural gas heater
4 ☐ propane heater
5 ☐ range boiler
6 ☐ furnace
7 ☐ solar
8 ☐ no hot water heater

23. In the winter, how many rooms in the heated area of your home are not fully heated?

1 ☐ none
2 ☐ one
3 ☐ two
4 ☐ three
5 ☐ four or more

24. When was your heating system last cleaned and serviced?

1 ☐ within the past 12 months
2 ☐ more than 12 months ago
3 ☐ never
4 ☐ don't know

A.8

25. What were your energy costs for 1981?

electricity $ _____ propane $ _____

natural gas $ _____ other

oil $ _____ _____
please specify

26. Do you intend to apply for

CHIP _____ HILP _____

COSP _____

27. Do you intend to apply for any other provincial or federal loans or grants to accomplish home improvements or renovations?

Name the program _____

_____

_____

In order that a preliminary assessment may be made of your proposal, please describe, in detail, each proposed retrofit measure on the following pages.

SEALING, CAULKING & WEATHERSTRIPPING

1. Indicate the locations in your home that you propose to weatherstrip and caulk – be specific

_____

_____

_____

2. What is the current condition of these locations?

_____

_____

_____

3. Please provide specific details on the amount of work planned (indicate the number of lineal feet required – where applicable).

_____

_____

_____

4. Please provide a detailed cost break-down:

materials _____

_____

_____ TOTAL $_____

labor _____

_____ TOTAL $_____

number of person days (i.e. work days – 8 hour/day)_____

_____ TOTAL_____days

Is your quotation attached? _____

Company/Contractor Name_____

Company Address_____

_____

5. Estimate your energy savings.
(see guidelines on _____ per cent estimated savings).

WINDOWS, WALLS AND DOORS

1. Indicate the specific locations in your home you propose to retrofit or replace. (be specific)

windows _____

_____

doors _____

_____

walls _____

_____

2. What is the current condition?

windows _____

doors _____

walls _____

3. Please provide specific details on the amount of work planned:

windows _____

_____

doors _____

_____

walls _____

_____

4. Please provide a detailed cost break-down:

	Windows	Doors	Walls	TOTAL
Materials				$
Labor				$
Number of working days				DAYS

Is your quotation attached? _____

Company/Contractor Name

_____

_____

Company Address

_____

_____

5. Estimate your energy savings (see guidelines on estimated savings).

windows _____ per cent

doors _____ per cent

walls _____ per cent

A.9

BASEMENT

1. Indicate the specific work you propose to undertake in your basement.

_____

_____

_____

_____

2. What is the current condition of your basement?

_____

_____

3. Please provide a detailed cost break-down:

materials _____

_____ TOTAL $_____

labor _____

_____ TOTAL $_____

number of person days _____ TOTAL _____ days

Is your quotation attached? _____ Company/Contractor Name

_____

4. Estimate your energy savings (see guidelines)

_____ per cent Company Address

_____

_____

ATTIC

1. Indicate the specific work you propose to undertake in your attic.

_____

_____

2. What is the current condition of your attic?

_____

_____

3. Please provide specific details on the amount of work planned.

_____

_____

_____

4. Please provide a detailed cost break-down:

materials _____

_____ TOTAL $_____

labor _____

_____ TOTAL $_____

number of person days _____ TOTAL _____days

Is your quotation attached? _____ Company/Contractor Name

_____

5. Estimate your energy savings (see guidelines) Company Address

_____ percent _____

_____

MECHANICAL SYSTEMS AND LIGHTING
(furnace, ventilation, air-to-air heat exchanger)

1. Indicate the specific locations and in detail describe the proposed retrofit.

_____

_____

_____

2. What is (are) the current condition?

_____

_____

3. Please provide a detailed cost break-down:

materials _____

_____ TOTAL $_____

labor _____

_____ TOTAL $_____

number of person days _____ TOTAL _____days

Is your quotation attached? _____ Company/Contractor Name

_____

5. Estimate your energy savings (see guidelines) Company Address

_____ percent _____

_____

A.10

OTHER

1. Indicate specific locations and provide specific details on any additional retrofit measures you plan to undertake.

_____

_____

_____

_____

_____

2. What is the current condition?

_____

_____

_____

3. Please provide a detailed cost break-down:

materials _____

_____

_____ TOTAL $_____

labor _____

_____

_____ TOTAL $_____

number of person days _____

_____ TOTAL _____days

Is your quotation attached? _____ Company/Contractor Name

_____

4. Estimated energy savings (see guidelines) _____ per cent. Company Address _____

_____

_____

Canada
MANITOBA

NOTES:

APPENDIX B

RETROFIT GUIDELINES

AND

ENERGY AUDIT FORMS, WORKSHEETS AND REPORTS

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B.0 RETROFIT GUIDELINES AND ENERGY AUDIT FORMS, WORKSHEETS AND REPORTS

B.1 DESCRIPTION

Included in Appendix B are copies of the following forms, worksheets and data sheets used in the Energy Demo program:

(a) Retrofit Guidelines. These were sent to each homeowner whose house was accepted into the program. Outlined were the basic features of various retrofit measures along with possible problem areas. Attached were copies of various energy conservation publications relevant to the retrofit project.

(b) House Assessment. This form was completed on-site during the energy audit and documented the major characteristics of the house. Information was collected by direct observation and through discussion with the homeowners.

(c) Primary Retrofit Review. This form was used by the auditors as a checklist when considering the possible consequences of proposed retrofit measures. Anticipated problem areas were reviewed with the homeowners.

(d) Air Leakage Source Checklist. This was completed during the pre-retrofit airtightness test examination while the house was depressurized and leakage sources could be identified using a smoke pencil. A copy of the checklist was left with the homeowners, to be used as a guide for any planned air leakage sealing.

(e) Retrofit Proposal Evaluation. This report was completed by the auditors and forwarded to the Program Coordinator after the HOTCAN simulations had been completed, the original retrofit proposal had been assessed, and the results of the energy audit had been reviewed with the homeowners. The report summarized the projected effects of each proposed retrofit measure and various combinations of measures, and the recommendations regarding acceptance or rejection based on the Energy Demo program requirements.

(f) Final Site Visit. This form was completed by the auditors after the retrofit project had been completed, the final site visit had been made, and the post-retrofit airtightness test had been done.

B.2 MANITOBA ENERGY DEMO

RETROFIT GUIDELINES

1983

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MANITOBA ENERGY DEMO
RETROFIT GUIDELINES

Most of the houses taking part in the Manitoba Energy Demo program are being extensively retrofitted to reach the goal of a 40% reduction in their total energy consumption. This usually requires extensive modifications to both the building and its heating system and involves a major financial commitment from the homeowner and the Energy Demo program. Needless to say, this demands that careful design, installation and workmanship be an integral part of each energy retrofit.

To provide homeowners and their contractors with extra guidance on the steps necessary to successfully complete the work, this document, the Retrofit Guidelines, has been prepared. The Retrofit Guidelines are not intended to serve as a "how-to" document nor do they describe every detail which should be considered for a given house. Rather they are designed to highlight some of the major factors which should be considered in any energy retrofit. In this way, the Retrofit Guidelines can be used as a checklist for both the construction and post retrofit periods. Each of the major types of energy retrofits are discussed separately. A series of illustrated pamphlets is also included with the Retrofit Guidelines to provide additional information.

CAUTIONARY NOTE

Retrofitting of houses to save energy is a rapidly-changing technology in which advances are made almost weekly. In the creation of these Retrofit Guidelines, every effort has been made to incorporate the latest knowledge in the wisest and safest possible manner. In some cases however, the information is so new that there has been little time available for extensive field-testing. As a result, a total understanding of the possible effects of some measures upon the behaviour of houses has not been obtained, and probably will not be obtained for several years. While the intent of this cautionary note is certainly not to dissaude any homeowner from carrying out the energy retrofit it is important that the homeowner recognize the evolving nature of the technology and only accept and use these Retrofit Guidelines on this basis.

BASEMENT INSULATION UPGRADING

DURING THE RETROFIT

Damp-proofing - Damp-proofing should be applied to the interior face of basements walls if there is evidence that water movement could occur through the wall into the new interior insulation, due to capillary action or leakage through small cracks. The three most common types of interior damp-proofing are bituminous coatings, asphalt impregnated building paper and polyethylene sheet. The damp-proofing should run from the bottom of the basement wall up to a point level with the exterior grade surface. If polyethylene sheet is being used, it can be hung from the floor joists or headers and then slashed vertically with a knife between grade level and its upper attachment point. If serious water leakage is occurring due to structural cracks, then water-proofing is probably required.

Water-proofing - All major sources of water leakage, such as large cracks in the basement wall, should be sealed to prevent damage to new interior insulation and wood framing. If the leakage is severe and cannot be sealed from the interior, it may be necessary to seal the wall from the exterior by excavating down to the crack and then sealing from the outside. In such cases, exterior basement insulation should also be considered.

Plumbing and Electrical Lines - Plumbing lines which run directly against the basement wall should either be relocated or left uninsulated on the warm side so they are not covered by new insulation which could cause freezing of the lines. Hot water pipes for hydronic heating systems do not have to be moved but should likewise be left uncovered on the warm side with insulation. Similarily, electrical wiring in poor condition may have to be relocated so it is not buried in the new insulation.

Air Leakage Sealing - To minimize condensation problems and reduce heat loss due to air infiltration, the junction between the floor system and the basement wall should be thoroughly sealed. The floor joist/basement wall,

header/basement wall and sub-floor/header joints should all be carefully sealed, preferably with butyl rubber caulking. Attempting to seal after the basement has been insulated is much more difficult and time-consuming.

Protection Against Water Damage - If the basement walls have experienced moisture problems in the past, then some thought should be given to the protection of any new interior insulation from moisture damage, even if the basement wall has subsequently been damp-proofed and/or water-proofed since these measures are not always completely effective. If the bottom plate of the new insulated frame wall is likely to get wet, then it may be desirable to use pressure-treated lumber. Also, a gap should be left under the bottom plate of the new frame wood to allow accumulated water to drain out. If polyethylene is used for damp-proofing, it may not be advisable to run the polyethylene under the bottom plate and seal it to the air-vapour barrier (on the warm side), since this can allow water to accumulate in the insulation.

Allowance for Basement Movement - To allow for vertical movement of the foundation wall or floor slab, a gap of at least 38 mm (1½") should be left between the new interior framed wall and the floor joists of the main floor or the floor slab.

Insulation and the Air-Vapour Barrier - New interior insulation should be applied in a uniform and even manner directly against the basement wall (or the damp-proofing, if installed). Once it is installed, a continuous, well-sealed air-vapour barrier, preferably 6 mil polyethylene, should be placed over the insulation. Particular attention should be given to achieving a good seal between the floor joists. If combustible rigid foam insulation is used on the interior, it must be covered with 13 mm (½") drywall or equivalent. Any rigid foam insulation used on the exterior must be suitable for below grade applications. Also, above grade portions should be protected against sunlight and mechanical damage with parging or other suitable covering.

AFTER THE RETROFIT

Moisture - Watch the basement carefully, particularly after heavy rains or in the spring, to see if water leakage is occurring. Pools of water forming under the insulated wall or a musty smell in the basement could indicate water leakage problems. It may be possible to minimize water problems by sloping the grade away from the basement wall or redirecting downspouts away from the building. As a last resort in extreme cases, exterior excavation and sealing may be required.

Frost Heave - Basements which are insulated on the interior are generally more susceptible to frost heaving problems and subsequent damage to the basement wall. If heaving does occur and proves to be serious, obtain professional advice before proceeding. Basement walls insulated on the exterior are generally more stable because the temperature of the wall and surrounding soil is raised.

WALL RETROFITS

DURING THE RETROFIT

Single Wall Retrofits - Single wall retrofits are loosely defined as those in which a single layer of insulation is being added to the main walls of the house and in which the location of the air-vapour barrier is not being moved outwards. Of primary concern with such a retrofit is the need to protect the new wall from possible condensation/moisture problems. To minimize this possibility, a thorough sealing of the interior side of the main walls should be performed (see "Air Leakage Sealing"). Baseboards, door and window trim, electrical outlets and switches, etc. should all be sealed to minimize the movement of warm, moist air from the indoors through the insulation to the outdoors. Sealing is especially important when the new insulation is impermeable to water vapour.

Double Wall Retrofits - Double wall retrofits are generally defined as the addition of two layers of insulation to the wall with the relocation of the air-vapour barrier, generally to the exterior of the existing wall. Again, to minimize potential condensation/moisture problems, particular emphasis has to be placed on minimizing air leakage from the interior of the house to the outdoors through the walls. The new air-vapour barrier should be 6 mil polyethylene and carefully sealed at all joints, junctions and edges of adjacent sheets. To further minimize potential condensation problems at least twice as much insulation must be located on the cold side of air-vapour barrier as the warm side.

Support of the New Wall - With exterior retrofits it is important that adequate structural support be provided to hold up the additional wall, especially if the new exterior finish is a heavy material such as stucco. Support can be provided by a properly-engineered bottom ledge attached to the foundation or the floor headers, by tying the new wall into the overhangs, by using metal strapping from the bottom ledge to the existing wall, and by constructing plywood gusset plates between the two walls. In

most cases, a combination of the above will be required. If in doubt, professional assistance should be obtained.

Partially Insulated Existing Walls - If the existing wall cavities are not completely filled with insulation and cannot be economically filled, air spaces may be left through which air can leak from the house interior up into the attic. This will short-circuit any new insulation which is added to the exterior of the walls and could possibly lead to condensation problems in the attic. Therefore if the existing wall is not completely filled, it is essential that each cavity be sealed at the attic level and any other locations through which leakage could be occurring. In many cases fortunately, the wall cavities are already sealed by the top plate of the existing wall.

Existing Services on Exterior Walls - Electrical service conduits and joints in gas lines which run on the exterior of existing walls can not be covered with new insulation. To prevent overheating, electrical service conduits will have to be relocated by an electrician or left uncovered by the new insulation. An electrical permit will be required. Similarly screwed joints in gas lines have to either be welded or relocated so they are not covered with insulation. If in doubt, consult your gas utility.

Application of New Exterior Finishes - When installing the new exterior finish, it is important that the manufacturer's or supplier's instructions be carefully followed. This is especially important if the new finish is installed directly over an impermeable insulation. Adequate structural support, especially for heavy sidings such as stucco, must be provided. If in doubt, obtain professional advice.

Humidifers - With the lower air leakage rate, resulting from the wall retrofit, humidity levels in the house will rise. Therefore there will likely be no need to use a humidifier under normal occupancy conditions.

AFTER THE RETROFIT

Moisture - With the higher humidity levels, it may be necessary to reduce the amount of moisture production in the house or to increase the ventilation rate to prevent condensation problems. Windows can be used as a guide to determine if additional ventilation is required; only trace amounts of condensation should form on them. The ventilation rate can be increased by using exhaust fans, briefly opening doors or windows or by increasing the air flow through the fresh air duct (which, if installed, is connected to the return air plenum of the furnace) by adjusting the damper position. If no fresh air duct is currently installed and moisture problems persist, it may prove necessary to install one.

Combustion Air Supply - Depending on what other work is being performed on the house and how tight it is eventually sealed, it may be necessary to install a combustion air supply for the (existing or new) furnace. The duct should run from the outdoors to a point at least 1 m (3') from the furnace and can be installed in the shape of a sideways "S" to minimize extraneous air leakage. Indications of an inadequate combustion air supply to the furnace are backdrafting of exhaust gases out of the draft diverter or barometric damper and unusual odours when the furnace first fires. The problem is most pronounced in the early fall and late spring when the chimney draft is weakest.

Unvented Heaters - Since the quantity of fresh air introduced into the house will be reduced, the use of combustion heaters which exhaust directly into the living space should not be used unless proper ventilation is provided.

Stability of the New Wall - Check the new wall carefully for the first year to make sure there is no separation from the existing wall. Pay particular attention to the top and bottom of the wall and exterior trim around doors and windows to determine if any differential movement is taking place.

DOOR AND WINDOW REPLACEMENT

DURING THE RETROFIT

Installation - Energy efficient doors and windows generally have fewer problems than conventional units. However, make sure that they are properly installed, that all weatherstripping fits snugly without binding and that all mechanisms work smoothly. Don't forget that new doors and windows should be carefully sealed into the rough openings to minimize air leakage and that all joints, including those around the trim should be carefully caulked. Remember that all houses taking part in the Energy Demo Program will have a second air leakage test performed on them after the work is completed to see how tightly the new units have been installed.

ATTIC INSULATION UPGRADING

DURING THE RETROFIT

Insulation Distribution - Install the insulation in a uniform and even manner, making sure that there are no gaps between adjacent batts of insulation and that loose-fill insulation is applied to a uniform thickness across the attic space. Be careful that any vents, especially those at the soffits are not covered. Recessed lights should not be covered with insulation.

Air Leakage Control - Most attic condensation problems are caused by moist air leaking into the attic space. Therefore, every effort should be made to carefully seal the ceiling area, attic hatch, plumbing stacks and any other possible sources of air leakage. In some cases, sealing of interior partition walls may be required. If no air-vapour barrier is installed, then one should be applied if possible.

Exhaust Fans - To further minimize condensation problems exhaust fans should not exhaust directly into the attic. Exhaust ducts from bathroom or kitchen fans which run through the attic should be carefully checked for leakage and sealed with duct tape if any cracks or holes are found in them.

Electric Wiring - Older-style electric wiring which runs through the attic and is in poor condition should not be covered with insulation since this could lead to overheating and pose a possible fire-risk. Either re-locate or replace the old wiring.

AFTER THE RETROFIT

Attic Condensation - During the first winter after the attic is insulated, carefully watch for any evidence of condensation, such as water marks or staining of ceilings or walls. If condensation does become a problem, try to locate the sources of air leakage into the attic and seal them. It may be necessary to increase the number of attic vents if condensation problems persist.

AIR LEAKAGE SEALING

DURING THE RETROFIT

What to Seal - In general, the sources of air leakage will vary, to some degree, between houses. However, for retrofit purposes, the list of air leakage locations left with the homeowner after the first air leakage test should be used as a guide for what to seal. All cracks less than 6 mm (¼") in width should be carefully caulked, larger gaps should be filled with foam strips or sheets and then caulked. Doors and windows should be carefully weather-stripped. Particular attention should be paid to any leakage paths which may lead into the attic since air exfiltration from the living space into the attic can lead to serious attic condensation problems.

Odours - Since some people may be sensitive to the solvents used in some caulks, it may be necessary to increase the ventilation rate in the house, by keeping doors and windows open, until the caulking is thoroughly dry and the odours have diminished. This should not take longer than 2 or 3 days.

Final Air Leakage Test - All houses taking part in the Energy Demo program will have a final air leakage test performed on them once all the retrofit work is completed. For houses which are being sealed to reduce air leakage, this test can be used as a quality control check to verify that the original sources of leakages have been sealed (as well as is realistically possible) and that new ones have not been created.

Humidifiers - With the lower air leakage rates, humidity levels will rise in the house. Therefore, there will probably be no need to use a humidifier under normal occupancy conditions.

AFTER THE RETROFIT

Moisture - See "Moisture" of Wall Retrofits.

Combustion Air Supply - See "Combustion Air Supply" of Wall Retrofits.

Unvented Heaters - See "Unvented Heaters" of Wall Retrofits.

FURNACE REPLACEMENT

DURING THE RETROFIT

Test Run - Make sure that the new unit is properly installed by having the contractor conduct a complete test run to insure that all components are functional. Also, have him explain the unique features of the unit and what differences you can expect in its operation compared to your old unit. Make sure that the telephone number of the serviceman is posted on the new furnace.

Automatic Set-Back Thermostat - Most new furnaces come equipped with an automatic set-back thermostat. These can save surprisingly large amounts of energy so insure that your unit is functional and in use.

AFTER THE RETROFIT

Moisture - If the new furnace uses a flue draft damper, or is a condensing or pulse type unit, there will be less dilution air drawn into the house for the furnace and thus humidity levels can be expected to increase. With the higher humidity levels, it may be necessary to reduce the amount of moisture production in the house or to increase the ventilation rate to prevent condensation problems. The windows can be used as a guide to determine if additional ventilation is required; only trace amounts of condensation should be allowed to form on them. The ventilation rate can be increased by using exhaust fans, briefly opening doors or windows or increasing the air flow through the fresh air duct. If no fresh air duct is currently installed and moisture problems persist, it may be necessary to install one.

Combustion Air Supply - See "Combustion Air Supply" of Wall Retrofits

B.3 MANITOBA ENERGY DEMO

HOUSE ASSESSMENT

ADDRESS: LOCATION: AGE: TYPE OF HOUSE:	FILE NO: DATE:

OCCUPANT LIFESTYLE DATA
- NUMBER OF OCCUPANTS:
- LENGTH OF OCCUPANY:
- INDOOR AIR TEMPERATURE - DAY: MAIN FLR(S) ; BSMT.
  NIGHT: MAIN FLR(S) ; BSMT.

FOUNDATION
- EVVIDENCE OF DIFFERENTIAL SETTLEMENT OR HEAVING:
- SIZE AND LOCATION OF FDN. CRACKS:
- EVIDENCE OF WATER LEAKAGE:
- EVIDENCE OF FLOOR SLAB MOVEMENT:
- BASEMENT INSULATION (TYPE & AMOUNTS):

EXTERIOR WALLS
- BALLOON OR PLATFORM FRAME CONSTRUCTION:
- EVIDENCE OF INTERIOR MOISTURE DAMAGE:
- EVIDENCE OF EXTERIOR MOISTURE DAMAGE:
- WALL INSULATION (TYPE & AMOUNT):
- WALL COMPOSITION:

ATTIC
- EVIDENCE OF MOISTURE DAMAGE ON CEILING OR IN ATTIC:
- ANY EXHAUST FANS VENTING DIRECTLY INTO ATTIC:
- TYPE AND NUMBER OF ATTIC VENTS:
- NUMBER OF POT LIGHTS EXTENDING INTO ATTIC:
- TYPE AND AMOUNT OF INSULATION:

HEATING AND VENTILATION SYSTEMS
- TYPE OF FUEL:
- AGE OF FURNACE:
- TYPE OF HEATING SYSTEM (F/A, B/B, GRAVITY AIR):
- UNUSUAL ODORS FROM FURNACE (H/X CRACKED?):
- BACKDRAFTING (ESP. DURING SPRING OR FALL OR EXH. FAN OPERATION):
- OUTDOOR AIR DUCT TO R/A DUCT:
- IS HEAT DISTRIBUTION SYSTEM ADEQUATE?

LIST ALL COMBUSTION APPLIANCES:
INTERIOR OR EXTERIOR CHIMNEY:
LOCATION OF ALL EXH. FANS:
DO ANY EXH. FANS LEAK COLD AIR OR DRIP WATER:
HUMIDIFIER (& USAGE):
TYPE OF SECONDARY HEATING APPLIANCES:
SECONDARY HTG. SYSTEM FUEL CONSUMPTION AND COST:

AIR INFILTRATION AND AIR QUALITY
UNUSUAL ODORS OR STUFFINESS:
WINTER HUMIDITY LEVELS:
VENTING CURRENTLY REQ'D IN WINTER:
MOLD OR MILDEW ON ANY SURFACES:
COLD DRAFTS, WHERE:
WINDOW CONDENSATION:
FROST ON EXTERIOR WALL ELECTRICAL OUTLETS:
EVIDENCE OF AIR QUALITY-INDUCED ILLNESSES:

ELECTRICAL
AGE AND CONDITION OF EXISTING WIRING:
AMPERAGE CAPACITY

PLUMBING
AGE AND GENERAL CONDITION OF EXISTING PLUMBING:

WATER CONSUMPTION
CLOTHES WASHER (WARM OR HOT CYCLE):
DISHWASHER:
BATHS PER WEEK:
SHOWERS PER WEEK:

PROBLEMS WITH HOUSE

ADMINISTRATION
HAVE CHIP, COSF, HILP, ETC. BEEN CONSIDERED:
CHIP ENQUIRY FORM HANDED OUT:
PHOTOS TAKEN:
COPY OF AIR LEAKAGE LOCATIONS LEFT WITH OCCUPANTS:
NEXT STEP EXPLAINED:
NAMES OF HOMEOWNER(S) FOR CONTRACT PURPOSES:

B.4 PRIMARY RETROFIT REVIEW

NOTE POSSIBLE CONSEQUENCES OF RETROFIT

ADDRESS: LOCATION:	FILE NO. DATE:

AIR LEAKAGE SEALING

- HUMIDITY AND ODOR LEVELS RAISED ABOVE ACCEPTABLE LIMITS:
- WINDOW CONDENSATION:
- OCCUPANTS AWARE OF POSSIBLE ODORS FROM RETROFIT:
- COULD COMBUSTION/DILUTION AIR DUCTS BE REQ'D:
- COULD OUTDOOR AIR DUCT BE REQ'D FOR DRYER, ETC.:
- COULD ADDITIONAL EXHAUST FANS BE REQ'D:
- OCCUPANTS/CONTRACTOR AWARE OF SIGNIFICANCE OF SECOND AIR LEAKAGE TESTS:
- COULD SEALING CAUSE FIREPLACE BACKDRAFTING:

BASEMENT INSULATION UPGRADING

- WILL FLOOR SYSTEM BE ADEQUATELY SEALED AGAINST AIR INFIL:
- WILL BSMT. WATER LEAKAGE NEED TO BE CORRECTED:
- COULD WATER TABLE BE RAISED IN FUTURE (TREE REMOVAL, DOWNSPOUT RELOCATION, ETC.):
- WILL INSULATION COVER ANY OLD WIRING - OVERHEATING:
- WILL INSULATION COVER ANY PLUMBING - FREEZING:
- COULD INSULATION CAUSE HEAVING (E.G. SHALLOW FOOTINGS):

SINGLE AND DOUBLE WALL RETROFIT

- COULD RETROFIT LEAD TO MOISTURE DAMAGE OF EXISTING WALL:
- SHOULD INTERIOR WALL BE SEALED FROM INSIDE:
- WILL NEW WALL INS. BE SHORT-CIRCULATED BY AIR IN EXISTING WALL (E.G. BALLOON FRAMES):
- WILL NEUTRAL PRESSURE PLANE BE LOWERED DUE TO FURNACE REPLACEMENT:
- ADEQUATE OVERHANGS:
- WILL ELECTRICAL, GAS, ETC. LINES HAVE TO BE MOVED OR RELOCATED:

ATTIC INSULATION UPGRADING

- WILL ATTIC BE ADEQUATELY SEALED AFTER RETROFIT:
- WILL EXTRA VENTING BE REQ'D:
- WILL INSULATION COVER ANY OLD WIRING - OVERHEATING:

WINDOW AND DOOR UPGRADING OR REPLACEMENT
COULD A THIRD PANE BE USED RATHER THAN NEW WINDOWS:
COULD WINDOW CONDENSATION OCCUR:
PAYBACK UNDERSTOOD:

FURNACE REPLACMENT
COULD A COMBUSTION/DILUTION AIR DUCT BE REQ'D:
COULD ADDITIONAL AIR DUCT(S) BE EASILY INSTALLED:
COMBUSTION/DILUTION AIR DUCT PART OF NEW FURNACE:
WILL NEW OUTDOOR AIR DUCT ON R/A DUCT WITH A
2-SPEED FAN CAUSE DRAFTS:
WILL OUTDOOR AIR DUCT ON R/A DUCT HAVE MANUAL DAMPER:
WHERE WILL DHW TANK BE VENTED:
WILL A NEW CHIMNEY LINER BE REQ'D (OIL TO GAS):

B.5 MANITOBA ENERGY DEMO AIR LEAKAGE SOURCE CHECKLIST

ADDRESS: FILE NO:
LOCATION: DATE:

MAJ	MIN	NIL	N/A	AIR LEAKAGE SOURCE	NOTES
				BASEMENT	
				Floor joists	
				Floor header/subfloor	
				Floor beam foundation penetration	
				Basement windows	
				Rainspout entry and drain	
				Floor drain	
				Foundation cracks	
				Plumbing/Electrical/Dryer penetrations	
				Electrical Panel	
				Electrical Outlets	
				Baseboards	
				Chimney/Cleanout	
				MAIN FLOOR(S)	
				Baseboards	
				Windows	
				Doors	
				Electrical fixtures on interior partitions	
				Electrical fixtures on exterior walls	
				Fireplace	
				Plumbing/Electrical penetrations	
				Old bathroom vent	
				Exhaust fans	
				Ceiling-mounted light fixtures	
				Wall-Ceiling interface	
				Attic hatch	
				Cracks in finished surfaces	
				Unfinished interior surfaces	
				Door and window trim	
				Milk chute	
				Mail slot	
				OTHER	

B.6 MANITOBA ENERGY DEMO PRELIMINARY REPORT:

RETROFIT PROPOSAL EVALUATION

FILE:

ADDRESS:

DATE:

SUMMARY

HOUSE TYPE:

AGE GROUP:

TYPE OF RETROFIT:

REQUIREMENT: REDUCTION
OF TOTAL ENERGY CONSUMPTION:

REQUIREMENT: MAXIMUM ALLOWABLE
TOTAL ENERGY CONSUMPTION:

PAYBACK EVALUATION:

UNIES Ltd.
APPIN SOLAR ASSOCIATES, INC.

RETROFIT PROPOSAL EVALUATION

TABLE 1 - ENERGY ANALYSIS

ADDRESS:

SIMULATION	ANNUAL SPACE HEATING CONSUMPTION				ANNUAL TOTAL ENERGY CONSUMPTION			
	As Heat (kWh)	As Fuel (kWh)	Saving on Case #1 (kWh)	(%)	As Fuel (kWh)	(kWh/m²)	Saving on Case #1 (kWh)	(%)

RETROFIT PROPOSAL EVALUATION

TABLE 2 - APPROXIMATE PAYBACK ON BASE CASE SIMULATION

ADDRESS:

RETROFIT OPTION	COST (P = PROPOSED E = ESTIMATE)	ANNUAL FUEL SAVING (SIMULATION RESULT) AT 1983 FUEL PRICES	SIMPLE PAYBACK IN YEARS

RETROFIT PROPOSAL EVALUATION

TABLE 3 - RECOMMENDATIONS

ADDRESS:

OPTION PROPOSED	RECOMMENDED FOR APPROVAL[1]		NOT RECOMMENDED[2]	ADDITIONAL QUOTES REQUIRED
	HIGH PRIORITY	LOW PRIORITY		

1. Options starred in high priority column are required to meet Energy Demo Program budget unless otherwise noted. When preparing revised cost estimates these items must be included before low priority items may be added. Total costs must be less than $10,000.00.

2. Not fundable under Energy Demo Program.

RETROFIT PROPOSAL EVALUATION

NOTES ON TABLES 1, 2, AND 3

ADDRESS:

B.7 ENERGY DEMO
FINAL SITE VISIT

ADDRESS: FILE:

LOCATION: DATE:

AUDITOR:

RETROFIT MEASURE	CHECK COMPLETE	CONDITION (NOTE WORKMANSHIP, DEFICIENCIES, VARIATIONS, OMISSIONS)

RECOMMENDED FOR FINAL PAYMENT? _____

PREDICTED AIR INFILTRATION RATE, BEFORE _____ AC/HR
PREDICTED AIR INFILTRATION RATE, AFTER _____ AC/HR
REDUCTION- _____ AC/HR
PERCENTAGE REDUCTION- _____ %

NOTES:

APPENDIX C

COMPLETED ENERGY DEMO RETROFIT HOUSES

TABLE OF CONTENTS

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C.2.1	1 Storey Houses Pre-1945: 017 031 036 044 081 115 132 149 164 174 202 1945-70: 006 009 012 024 028 052 062 063 065 070 073 096 116 127 130 137 166 183 184 205 208 . . .	C.5
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C.2.5	Split-level Houses 1945-70: 076 083 101	C.93

C.0 COMPLETED ENERGY DEMO RETROFIT HOUSES

C.1 INTRODUCTION

Appendices C and D comprise descriptions of the 154 individual Energy Demo retrofit houses which were examined at least to the energy audit stage, including the projects which were retrofitted under Energy Demo. The series of house files is arranged with the funded group (83) as Appendix C, and with the group of proposed projects (71) which were not carried beyond the energy audit stage as Appendix D.

The organization of house files reflects the two main descriptors of the Manitoba pre-1970 housing stock, i.e., partitioning of Appendix C is according to style and vintage, i.e.:

(a) style: single storey (incl. bungalow, slab-on-grade, bi-level), split-level and 1 1/2, 2 (incl. 1 3/4) and 2 1/2 storey,

(b) vintage: pre-1945, 1945-1970.

The information appearing in each file has been compiled from the following sources:

(a) initial homeowner's Energy Demo project application,

(b) data collected during the energy audit site visit and other visits to the house prior to, during, and following the construction period,

(c) conversations with the homeowner,

(d) retrofit project component evaluation.

Each house file consists of three parts, described below:

FILE # ENERGY DEMO RETROFIT PROJECT

GENERAL DATA

Location:	City, town or municipality.
Vintage:	Known or estimated (est.).
Style:	Split level, bungalow, bi-level, 1 1/2, 1 3/4, 2, 2 1/2 storey.
Wall type:	Structural type (e.g., wood frame, double brick), and exterior finish (e.g., stucco, wood siding).
Basement type:	Style (e.g., full basement, slab, crawlspace), and structural material (e.g., poured concrete, blocks, stone and mortar, pressure-treated wood).
Floor area:	Full height living space only, incl. above grade and basement portions, regardless of level of development.
Interior volume:	Heated living space including basement.
Heating system:	Heating fuel (e.g., natural gas, electricity, heating oil, wood, propane, coal), and type of distribution system (e.g., forced air, gravity hot water).
Occupants:	Number of persons normally residing in the house.
Occupancy:	Approximate time when current occupants took up residence.
Project started:	Approval given for construction of retrofit project.
Project completed:	Work completed on retrofit project.

PRE-PROJECT HOUSE

Ceilings: Main walls: Basement: Doors: Windows:	Description of various subcomponents of the building envelope including structural materials and style, insulation materials and amounts.

Air change:	Estimated average natural infiltration rate for period mid-September to mid-May, determined according to method of Shaw (using hourly weather data and airtightness test data [draft CGSB procedure]), and forced or induced additional ventilation equipment.
Heating equipment:	Main space heating appliance and supplementary space heating equipment, assumed seasonal performance, location of chimney for combustion equipment.
Domestic hot water:	Fuel used (e.g., natural gas, electricity).
Temp. settings:	As reported by occupants and/or as assumed in analysis.
Humidity:	Reported or observed levels, status of possible sources (e.g., clothes dryer, humidifier).

ENERGY RETROFIT

Initial Proposal:	Items appearing in the Energy Demo application form initially submitted, i.e., reflecting preferences and perceptions prior to energy audit process.
Audit Findings:	Description of retrofit project components, deletions and revisions suggested as a result of energy audit site visit, proposal assessment, discussion with homeowners, etc.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		

The various sub-projects making up the Energy Demo retrofit project are isolated wherever possible into material and labour costs as actually incurred at the time of construction.

Expected annual energy saving is that derived from annual simulation using HOTCAN, with the following operating conditions assumed:

- main and upper levels temperature setting: 21 C.
- below-grade living space temperature setting: 18 C.
- base electrical load for appliances, lights: 14 kWh/day.
- consumption for domestic hot water heating: 14 kWh/day.
- sensible heat gain from occupants: 3.2 kWh/day.

- seasonal space heating fuel conversion efficiency as estimated for the pre-project house and for the post-retrofit situation (cases with significant use of secondary heating appliances are noted).

Actual energy consumption and energy savings may vary significantly from the calculated values due to several factors, including:

- individual preferences for operating temperatures, electricity and water heating usage patterns which vary from those values assumed,
- variations in interior temperature profiles and actual envelope composition compared to those values assumed in the evaluation,
- uncertainty in the modelling of below-grade heat losses, solar utilization, and other energy-related phenomena in residences.

Payback proxy is a measure of retrofit cost effectiveness with respect to energy savings alone, and is calculated as the incurred cost of the measure divided by the expected annual energy saving as determined above.

Change in estimated natural air leakage: the air leakage reduction resulting from the retrofit project, on the basis of:

- estimated average natural infiltration rates (for mid-September to mid-May) as determined with regionalized method of Shaw, using pre- and post-retrofit airtightness test data and hourly weather data.

In some cases anomalous results can be attributed to unfavourable wind conditions at the time of pre- or post-retrofit airtightness tests. Renovations in progress in some cases affected airtightness test results.

C.2 COMPLETED ENERGY DEMO RETROFIT HOUSES

C.2.1 1 Storey Houses

Pre-1945:	ED 017	Winnipeg
	ED 031	Winnipeg
	ED 036	Selkirk
	ED 044	Selkirk
	ED 081	Winnipeg
	ED 115	Winnipeg
	ED 132	Winnipeg
	ED 149	Foxwarren
	ED 164	Winnipeg
	ED 174	Brandon
	ED 202	Winnipeg
1945-70:	ED 006	Plum Coulee
	ED 009	Winnipeg
	ED 012	Winnipeg
	ED 024	Winnipeg
	ED 028	Winnipeg
	ED 052	Winnipeg
	ED 062	Winnipeg
	ED 063	Winnipeg
	ED 065	Balmoral
	ED 070	Garson
	ED 073	Winnipeg
	ED 096	Winnipeg
	ED 116	Winnipeg
	ED 127	Winnipeg
	ED 130	Winnipeg
	ED 137	Winnipeg
	ED 166	Winnipeg
	ED 183	Winnipeg
	ED 184	Thompson
	ED 205	Winnipeg
	ED 208	Virden

FILE # ED017

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	bungalow
Wall type:	wood frame, 80% stucco, 20% wood siding
Basement type:	full, concrete
Floor area:	73 square metres above grade, 70 square metres in basement
Interior volume:	344 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	approx. 1953
Project started:	December 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	150mm wood shavings plus 2 layers of RSI 4.9 glass fibre batts.
Main walls:	plywood panelling over lath and plaster on interior, wood siding under current siding, shiplap both sides, 89mm cavities filled with wood shavings, some settlement likely.
Basement:	joists, headers on sill plate, 0.8m above grade, 39m perimeter uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG, incl. sealed units (12mm spacing) in living room, dining room, kitchen, bathroom, and single plus wood storm types in basement, hall, and bedrooms.
Air change:	0.34 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace less than 10 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 20.5 C; winter basement temp. approx. 16 C.
Humidity:	winter levels high, dryer vented indoors, humidifier not used.
Remarks:	moisture, mould levels high because of family size compared to house size.

ENERGY RETROFIT

Initial Proposal:
replace 14 windows with TG units, 2 doors with steel, insulated type.
reinsulate and refinish 8m master bedroom wall from interior.
frame and insulate basement walls from interior to RSI 2.1 level.
seal, caulk, weatherstrip selected areas and add vents to attic.

Audit Findings:
basement is the only major heat loss area: RSI 3.5 level more appropriate.
air leakage at headers likely cause of discomfort in bedroom: basement seal should concentrate on header areas due to nature of construction.
high moisture production within house by large density of occupants could be dealt with through installation and use of exhaust fans in bathroom and kitchen high-load areas.
poor expected simple payback periods for windows and doors; not advisable to replace these until moisture problem solved - existing windows show moisture damage, previous furnace rusted out.
overall air leakage not severe for age of house: stucco now covers header; suggest air sealing to reduce moisture flow to attic (not yet serious).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Reinsulate bedroom, 8m, RSI 2.1	$ 321	$ 425	$ 746	400	103.3
Basement walls, 39m, RSI 3.5	1325	710	2035	23700	5.3
Other: 2 fans, 4 vents	293	267	560	-	-
Totals	$1939	$1402	$3341	24200	8.5
Change in estimated natural air leakage: -15 % reduction from 0.34 to 0.39 ac/h (exhaust fans).					

FILE # ED031

GENERAL DATA

Location:	Winnipeg
Vintage:	approx. 1920
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, stone and mortar parged over
Floor area:	66 square metres above grade, 56 square metres in basement
Interior volume:	324 cubic metres
Heating system:	natural gas, forced air
Occupants:	2-3
Occupancy:	pre-1981
Project started:	September 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	RSI 2.1 plus RSI 3.5 glass fibre batts parallel to joists.
Main walls:	exterior board sheathing, wall cavities opened and insulated with RSI 2.1 glass fibre batts, new vapour barrier and drywall (1981 or 1982).
Basement:	full beamfill, 1.0m above grade, 31m perimeter uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	DG sealed or silder units in basement and one TG sealed unit, main level TG units, mostly single aluminum sliders with double exterior aluminum storms, except living room sealed unit (12mm spacings) and one poorly functioning 3rd storm pane on DG unit.
Air change:	0.19 ac/h natural, very tight because of interior refinishing upstairs and interior parging and caulking in basement header area, one exhaust fan.
Heating equipment:	high-efficiency condensing gas furnace (vintage late 1982), assumed seasonal efficiency 0.90, interior chimney, 2-speed fan.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, continuous low-speed fan operation with fresh air intake to return air duct.
Remarks:	small house with extensive renovation work already completed.

ENERGY RETROFIT

Initial Proposal:	frame, panel, and insulate basement to RSI 3.5 level, including moving basement stairs to accommodate thickness of insulated wall.
Audit Findings:	with low heat loss in other areas, uninsulated basement walls are largest remaining heat loss component: proposed upgrading cost is somewhat higher than average because of choice of panelling for interior finish; unnecessary to move stairway: effect on energy use insignificant. reduction of heat loss via uncovered ceiling joists in attic is a priority: one layer of RSI 3.5 batts perpendicular to joist direction is advised.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 31m, RSI 3.5	$ 816	$1161	$1977	16200	7.5
Attic upgrade, 65m^2, add RSI 3.5	235	0	235	800	17.1
Other: renew 3rd pane, 0.5m^2	73	0	73	-	-
Totals	$1124	$1161	$2285	17000	8.2

Change in estimated natural air leakage: 20 % reduction from 0.19 to 0.16 ac/h.

FILE # ED036

GENERAL DATA

Location:	Selkirk
Vintage:	1930 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	partial, concrete
Floor area:	74 square metres above grade, 27 square metres in basement
Interior volume:	272 cubic metres
Heating system:	oil, forced air
Occupants:	3
Occupancy:	October 1982
Project started:	May 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	150mm wood shavings.
Main walls:	38X89mm framing with UFFI.
Basement:	joists, headers on sill plate, 0.6m above grade. 35m perimeter insulated full height with 100mm rigid expanded polystyrene board; 13m of the perimeter is associated with 20 square metre crawl space 0.7m high; 13m of the perimeter is associated with 21 square metre crawl space 0.9m high.
Doors:	2 @ wood doors with aluminum storm doors.
Windows:	1 TG sealed unit in living room, 8 DG sliders, wood frames.
Air change:	0.72 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	unknown.
Humidity:	winter levels low.
Remarks:	energy-conservation upgrading planned in conjunction with UFFI removal.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip light fixtures, attic hatch, ceiling-wall interface. replace 2 wood doors with insulated, metal type. after UFFI removal: double-wall retrofit to 37m perimeter to final RSI 7.2. install air-to-air heat exchanger to help control contaminant and humidity levels in house. install combustion air duct to vicinity of oil furnace.
Audit Findings:	suggested to convert to electric heating system. homeowner to provide the labour for the double wall retrofit. advisable to cover exposed rigid insulation in basement with fire-resistant material.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Double-wall retrofit, 3.0X37m	$2184	$ 0	$2184	15800	4.9
Door replacement	742	0	742	1200	21.3
Seal, caulk, weatherstrip	115	0	115	2900	1.4
10 kW electric furnace	1097	0	1097	12400	3.1
Air-to-air heat exchanger	1040	910	1950	-	-
Totals	$5179	$ 910	$6089	21200	10.1

Change in estimated natural air leakage: 61 % reduction from 0.72 to 0.28 ac/h (with installed ventilation system, natural air change rate is augmentable as required).

FILE # ED044

GENERAL DATA

Location:	Selkirk
Vintage:	1930 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	partial, concrete
Floor area:	54 square metres above grade, 19 square metres in basement
Interior volume:	204 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	October 1982
Project started:	June 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	140mm vermiculite.
Main walls:	double shiplap interior sheathing, single exterior shiplap sheathing, 38X89mm framing with empty wall cavities.
Basement:	joists, headers on sill plate, 0.4m above grade, header areas uninsulated. 31m perimeter uninsulated: 0.8m high crawl space (33 square metres) surrounds central excavated portion.
Doors:	2 @ wood doors, one with wood storm door and intervening space insulated with RSI 3.5 glass fibre batts, one opens to enclosed porch.
Windows:	all DG including single-hung types with storms, wood sliders, and 2 fixed basement windows with storms and intervening RSI 3.5 batts.
Air change:	0.33 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conv. gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 18 C.
Humidity:	winter levels high.
Remarks:	single-hung windows in poor condition.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor; replace one door. replace 5 single-hung type windows with TG units, add storms to 3 sliders. blow loosefill glass fibre into empty wall cavities from exterior. insulate and seal crawl space walls and header areas from interior. add RSI 4.9 blown-in loosefill glass fibre to attic, seal penetrations. install bathroom exhaust fan to reduce humidity levels.
Audit Findings:	exterior application of 50mm extruded polystyrene including horizontal skirt to crawl space walls easier to implement successfully to reduce air flow into house, would also protect shallow footing against freezing; with increased airtightness, combustion air supply may be needed. central exhaust system with outlet through crawl space wall also appropriate alternative to bathroom exhaust fan through wall or attic.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 270	$ 284	$ 554	1000	34.4
Windows (6.5m^2) and door as above	3483	375	3858	1700	139.0
Main walls, 2.4X32m, RSI 2.1	468	664	1132	11900	5.9
Crawl space walls, 31m, RSI 1.8	716	807	1523	11300	8.3
Attic upgrade, 54m^2, add RSI 4.9	368	171	539	3800	8.8
Bathroom fan	50	0	50	-	-
Totals	$5355	$2301	$7656	28700	16.4

Change in estimated natural air leakage: 32 % reduction from 0.33 to 0.22 ac/h.

FILE # ED081

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30
Style:	bungalow
Wall type:	wood frame, wood siding (shakes)
Basement type:	full, concrete
Floor area:	52 square metres above grade, 48 square metres in basement
Interior volume:	234 cubic metres
Heating system:	natural gas, gravity air
Occupants:	2
Occupancy:	October 1980
Project started:	October 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	wood shavings to 89mm joist tops plus 300mm blown-in loosefill glass fibre.
Main walls:	shiplap sheathing, 89mm wall cavities filled to high density with blown-in loosefill glass fibre; 8m of exterior walls face enclosed porches.
Basement:	joists, header on sill plate with interior parging extending up to subfloor, 0.8m above grade, 28m perimeter uninsulated.
Doors:	3 @ single wood doors (one is from basement) opening to enclosed porches.
Windows:	DG single-hung or fixed types with wood storms, except living room DG sealed unit.
Air change:	0.68 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	gravity air furnace (circa 1947) converted to natural gas, assumed seasonal efficiency 0.60, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 21 C.
Humidity:	winter levels medium despite air leakage, small house, humidifier not used.
Remarks:	small house, sill plate type joist system with major air leakage at headers.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip main level of house by homeowner. insulate exterior of basement walls from approx. 0.3m above main floor level to 0.6m below grade plus 1.2m horizontally away from house. seal ceiling penetrations, apply vapour barrier, increase attic ventilation. replace furnace with energy-efficient type and convert to forced-air system.
Audit Findings:	chosen furnace high-efficiency (approx. 0.90), condensing type. no excavation possible in narrow space between houses on west side: rigid insulation to be placed on grade (house to house) and covered; portion of perimeter with attached porches not to be insulated.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 20m, RSI 2.7	$1883	$ 0	$1883	6600	17.6
Condensing furnace, ductwork, etc.	2394	656	3050	9300	20.0
Other: ceiling and sealing work	268	0	268	4100	4.0
Totals	$4545	$ 656	$5201	16400	19.4

Change in estimated natural air leakage: 54 % reduction from 0.68 to 0.32 ac/h.

FILE # ED115

GENERAL DATA

Location:	Winnipeg
Vintage:	1929
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	81 square metres above grade, 67 square metres in basement
Interior volume:	375 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	May 1981
Project started:	September 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	unvented attic: 50mm wood shavings between joists, rafter spaces enclosed by roof boards and shiplap except over partially heated porch area.
Main walls:	shiplap both sides with 100mm cavities filled with wood shavings.
Basement:	joists on sill plate, 1.2m above grade, header areas uninsulated. 30m perimeter: 3m with 38mm expanded polystyrene to floor, 27m uninsulated. porch floor (10 square metres, heated) over crawl space uninsulated.
Doors:	1 @ wood with aluminum storm door, 1 @ wood opening to enclosed porch.
Windows:	mostly DG single-hung or fixed types with wood or aluminum storms, DG alum. slider in bathroom, 4 small casements with wood storms in living/dining area, 6 SG single-hung units in porch.
Air change:	0.58 ac/h natural, old bathroom vent, no fresh air intake.
Heating equipment:	conventional gas furnace approx. 7 years old, assumed seasonal efficiency 0.65, interior chimney; electric baseboard heater in insulated porch.
Domestic hot water:	electric.
Temp. settings:	56 h/wk @ 20.5 C, 112 h/wk @ 18 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low to medium, portable humidifier used.
Remarks:	major renewal of dwelling being undertaken with partly homeowner labour.

ENERGY RETROFIT

Initial Proposal:	replace or renew doors, all windows to TG units (QG at 4 orig. casements). rebuild bathroom and porch walls to RSI 3.5 level, reduce porch glazed area. insulate basement walls to RSI 3.5 level, porch floor to RSI 7.0; insulate and isolate existing furnace room, add combustion air duct. place and seal vapour barrier between joists in attic and add RSI 7.0 in layers of glass fibre batts, install roof vents when roof reshingled.
Audit Findings:	air sealing work is included with all proposed retrofit components. proposal reasonable except cost effectiveness of windows is doubtful. complex plans changing as time passes: firmer cost estimates required. possible that RSI 3.5 in basement would allow foundation to get too cold because of shallow depth.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 481	$ 500	$ 981	5700	10.7
Windows, approx. 8m^2, TG	3636	600	4236	6100	42.3
Basement, porch floor, as above	1057	950	2007	20400	6.0
Attic upgrade, 81m^2, RSI 7.0	994	400	1394	10600	8.1
Doors, walls, pipe insul., car timer	557	747	1304	3200	25.0
Totals	$6725	$3197	$9922	40200	15.1

Change in estimated natural air leakage: 34 % reduction from 0.58 to 0.38 ac/h.

FILE # ED132

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1945
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	half basement concrete walls on spread footings, half shallow footings and partial dugout.
Floor area:	54 square metres on main, 37 square metres in basement
Interior volume:	225 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	December 1980
Project started:	October 1983
Project completed:	December 1984

PRE-PROJECT HOUSE

Ceilings:	75-100mm wood shavings between joists.
Main walls:	double shiplap, 89mm cavities insulated with wood shavings, 30% settlement.
Basement:	joists, headers on sill plate, 0.7m above grade, header areas uninsulated. 28m perimeter: 13m full-height portion panelled with 38X64mm framing and RSI 1.4 glass fibre batts, 15m dugout portion with panelling and shelving around the 1m ledge which is 0.4m below grade.
Doors:	2 @ wood with aluminum storm doors.
Windows:	SG casement in kitchen, DG aluminum sliders in basement, DG sealed unit (12mm spacing) in living room, DG single-hung types with wood storm in kitchen, aluminum storms in bedrooms.
Air change:	0.99 ac/h natural, very leaky at basement dugout headers, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace more than 20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, humidifier used, dryer vented outdoors.
Remarks:	small house, extremely high infiltration at floor/foundation interface.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows and door. replace or rebuild main level windows and doors. strip off wood siding, apply approx. 50mm rigid insulation, new siding. refinish and insulate dugout portion of basement from interior. seal ceiling penetrations and add insulation to RSI 7.0 level. other: dimmers, insulate DHW tank and pipes.
Audit Findings:	advisable to top up wall cavity insulation with loosefill material. low priority to sheet exterior walls with rigid insulation: poor payback. insulation of dugout portion of basement from interior difficult and could lead to foundation problems: simple to seal and insulate from exterior. homeowner finished off basement from interior in addition to exterior work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Minor seal, add 1 TG, rebuild doors	$ 624	$ 404	$1028	2200	28.8
Top up main walls, 28m, cellulose	430	270	700	5500	7.8
Ext. basement walls, 28m, RSI 1.8	923	577	1500	9000	10.2
Attic upgrade to RSI 7.0	604	0	604	7400	5.0
Totals	$2580	$1252	$3832	24000	9.8

Change in estimated natural air leakage: 37 % reduction from 0.99 to 0.62 ac/h.

FILE # ED149

GENERAL DATA

Location:	Foxwarren
Vintage:	1920-30 (est.)
Style:	bungalow with additions
Wall type:	wood frame, vinyl siding
Basement type:	full under orig. portion, crawl space under additions, concrete block type
Floor area:	108 square metres above grade, 54 square metres in basement
Interior volume:	399 cubic metres
Heating system:	electric, baseboard
Occupants:	4
Occupancy:	November 1974
Project started:	November 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	RSI 3.5 glass fibre batts between ceiling joists.
Main walls:	orig. portion with double exterior shiplap, 89mm cavities with wood shavings partly settled (50% max.); newer portion with 38X89mm framing and RSI 2.1 glass fibre batts.
Basement:	0.4-0.5m above grade, header areas uninsulated. 49m perimeter: 31m with 0.7m high crawl space, 18m with full height basement all uninsulated.
Doors:	1 @ hollow wood with wood storm door. 1 @ solid wood opens to enclosed porch.
Windows:	all DG, half vinyl or aluminum sliders, half sealed or casement types.
Air change:	0.66 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	electric baseboard heaters; future wood stove installation planned.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low, some windows have frozen shut in winter, some frost on electrical outlets, dryer vented outdoors.
Remarks:	house moved on to present foundation approx. 1974; one concrete block wall bowed inward approx. 75mm.

ENERGY RETROFIT

Initial Proposal:	seal and weatherstrip windows and doors. add 3rd pane to all but basement windows. replace 2 wood doors with new solid wood units. upgrade wall insulation levels to RSI 3.5 from interior. frame and insulate full basement and crawl space to RSI 3.5 level. add another layer of RSI 3.5 glass fibre batts to attic. construct dropped ceilings in some areas and apply vapour barrier. renovate basement prior to insulating, i.e., pour floor slab, add teleposts. other: fluorescent lighting, insulate DHW lines.
Audit Findings:	important to seal, caulk, weatherstrip throughout house especially at junctions where different sections meet and in basement (incl. moisture proofing) prior to insulating. all tongue-and-groove sections of old ceiling should have vapour barrier installed, and penetrations to attic should be sealed; blown-in cellulose fibre chosen for attic insulation material. suggested to blow insulation into main walls of old portion of house instead of proposed work; newer portion of house to have 38mm rigid extruded polystyrene and gypsum board applied to walls.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
3rd panes, approx. 7.5m^2	$1080	$ 82	$1162	1900	22.1
Walls, basement, ceilings, air seal	2924	1930	4854	19500	9.0
Totals	$4004	$2011	$6015	20500	10.6
Change in estimated natural air leakage: 46 % reduction from 0.66 to 0.36 ac/h.					

FILE # ED164

GENERAL DATA

Location:	Winnipeg
Vintage:	1915-20 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	68 square metres above grade, 55 square metres in basement
Interior volume:	311 cubic metres
Heating system:	natural gas, forced air
Occupants:	1
Occupancy:	1980
Project started:	August 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	100mm joists with 50mm wood shavings plus 165mm blown-in rock wool over top.
Main walls:	shiplap both sides, 100mm cavities filled with shredded paper.
Basement:	10 square metre floor of old front porch (now living space) over crawl space insulated with wood shavings or sawdust. main basement full beamfill, 1.1m above grade, 30m perimeter uninsulated.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door which opens to enclosed porch.
Windows:	TG sealed units (12mm spacings) in north-facing living room and den, remainder are mixed DG types, e.g., vertical aluminum sliders and fixed and single-hung wood types with wood or aluminum storms.
Air change:	0.69 ac/h natural, bathroom vent, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace more than 20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	40 h/wk @ 16 C, 128 h/wk @ 20 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low, humidifier used.
Remarks:	stucco finish exhibits evidence of historical water damage in places.

ENERGY RETROFIT

Initial Proposal:	remove stucco, inspect wall, sheet with 50mm rigid extruded polystyrene board, apply foam-backed aluminum siding. frame and insulate basement walls to RSI 3.5 level. replace furnace with higher-efficiency (approx. 0.83), induced-draught type.
Audit Findings:	air leakage sealing is high priority, especially in upper part of envelope: to be included within other project components. attic insulation could be upgraded to RSI 7.0 level from existing RSI 4.1. cold front room floor could be improved by applying rigid material under floor, covering bottoms of joists and reducing air leakage. with existing wall insulation type, impermeable exterior insulation could lead to moisture problems: better to use semi-rigid glass fibre or batts; in any case, stucco finish needs attention and the opportunity to inspect walls and upgrade insulation levels is a golden one. shallow basement, houses close together: footings likely warm enough.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Front room floor, $10m^2$, add RSI 3.5	-	-	$ 300	-	-
Basement walls, 30m, RSI 3.5	-	-	1525	19400	4.8
Upgrade attic, $68m^2$, RSI 7.0	-	-	720	2400	18.1
Induced-draught furnace, thermostat	-	-	2190	10900	12.4
Totals	-	-	$4735	28000	10.4
Change in estimated natural air leakage: 33 % reduction from 0.69 to 0.47 ac/h.					

FILE # ED174

GENERAL DATA

Location:	Brandon
Vintage:	1920-30 (est.)
Style:	bungalow
Wall type:	double brick, stucco (except brick on lower 1m to grade on 3 sides)
Basement type:	full, concrete (crawl space under old front verandah, now living space)
Floor area:	87 square metres above grade, 78 square metres in basement
Interior volume:	419 cubic metres
Heating system:	oil, forced air
Occupants:	4
Occupancy:	mid-1982
Project started:	October 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	wood shavings plus blown-in loosefill cellulose to RSI 7.0.
Main walls:	brick wall strapped on interior, uninsulated, lath and plaster finish.
Basement:	partial beamfill, 0.6m above grade, header areas uninsulated. 41m perimeter: 27m with 38X64mm framing and RSI 1.4 batts set 90mm away from wall (footing partially exposed), 14m uninsulated full height including 9m perimeter of 1.0m high crawl space.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung and fixed types with wood storms, except 3 DG aluminum vert. and horiz. sliders, 1 DG and 1 TG sealed unit (12mm spacings).
Air change:	0.50 ac/h natural, kit. exhaust fan, no fresh air intake to return air duct.
Heating equipment:	oil furnace more than 20 years old, assumed seasonal efficiency 0.65, exterior chimney; supplementary 3 kW, 1 kW electric baseboard heaters in basement and kitchen, respectively.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 22 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to medium, no humidifier, minimal window condensation, dryer vented outdoors.
Remarks:	small attractive house; oil tank located in crawl space; unusual air gap behind framed walls of basement could be allowing short circuiting and convective action to increase heat loss from basement.

ENERGY RETROFIT

Initial Proposal:	seal and weatherstrip doors and windows. DG sealed units to be installed between inner and outer panes of 8 windows in living and dining rooms (existing units suitable for this). frame and insulate to RSI 2.1 unfinished basement wall and crawl space. replace furnace with high-efficiency (approx. 0.90) condensing natural gas furnace.
Audit Findings:	could fill gap behind existing insulated basement walls to ensure prevention of short circuiting: could remove wall panels to do this with glass fibre batts plus apply vapour barrier before repanelling, or could gain access from top of wall and add loosefill material in this area. suggest complete house air leakage sealing, RSI 3.5 in basement.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 295	$ 360	$ 655	4800	4.4
Add DG units as above, $6m^2$	750	240	990	3000	10.7
Basement walls, 14m, RSI 3.5	509	0	509	3900	4.2
Oil-to-gas conversion as above	2498	778	3276	16100	2.8
Totals	$4052	$1378	$5430	24500	4.2
Change in estimated natural air leakage: 25 % reduction from 0.50 to 0.37 ac/h.					

FILE # ED202

GENERAL DATA

Location:	Winnipeg
Vintage:	1930 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	88 square metres above grade, 87 square metres in basement
Interior volume:	434 cubic metres
Heating system:	natural gas, forced air
Occupants:	1
Occupancy:	approx. 1930
Project started:	July 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	main portion: wood shavings plus RSI 3.5 glass fibre batts to RSI 5.6 total. flat roof portion over sunroom: inaccessible, assumed 150mm wood shavings.
Main walls:	shiplap/boards both sides, 38X89mm framing with wood shavings, approx. 150mm maximum settlement.
Basement:	full beamfill, 1.0m above grade, 38m perimeter uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	DG sealed units (12mm spacing) in living room and sunroom, DG fixed or sliders in basement, remaining main floor windows DG or TG metal horizontal and vertical sliders.
Air change:	0.39 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace approx. 22 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 15.5 C, 56 h/wk @ 20 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low, humidifier used, dryer vented outdoors.
Remarks:	home in good shape, newly poured basement floor slab.

ENERGY RETROFIT

Initial Proposal:	replace doors with steel, insulated type. insulate main wall cavities, thought to be empty, with blown-in glass fibre. frame and insulate basement walls to RSI 2.1 level.
Audit Findings:	door replacement not cost effective by itself. wall cavities found to be virtually filled with wood shavings. due to potential foundation problems induced by exposure to severe temperatures, advisable to insulate shallow basement only to RSI 2.1 level; foundation cracks to be patched and damp-proofed. selected air sealing suggested for identified problem areas throughout home. opportunity is presented to replace aging furnace with high-efficiency (approx. 0.90) type, along with fresh air intake to return air duct.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Air sealing by contractor	$ 340	$ 342	$ 682	4400	9.5
Basement walls, 38m, RSI 2.1	972	736	1708	16500	6.4
Pulse-type furnace, fresh air intake	1580	825	2405	13400	11.0
Totals	$2892	$1903	$4795	28500	10.3

Change in estimated natural air leakage: 10 % reduction from 0.39 to 0.35 ac/h (new fresh air intake undampered; 26 % reduction to 0.29 ac/h with intake sealed).

FILE # ED006

GENERAL DATA

Location:	Plum Coulee
Vintage:	1958 (est.)
Style:	bungalow with additions
Wall type:	wood frame, aluminum siding
Basement type:	full, concrete (one addition over crawl space, one addition on slab)
Floor area:	134 square metres above grade, 77 square metres in basement
Interior volume:	463 cubic metres
Heating system:	oil, forced air
Occupants:	5
Occupancy:	likely more than 20 years
Project started:	October 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	111 square metres: 75mm vermiculite plus 75mm wood shavings plus 150mm loosefill cellulose fibre. 23 square metres: 300mm loosefill cellulose fibre.
Main walls:	38X89mm framing with approx. RSI 1.8 glass fibre batts, except for one of the additions which has RSI 2.1 glass fibre batts.
Basement:	full beamfill, 0.7m above grade (average), headers and slab uninsulated. main portion and one addition: 45m perimeter: 4m/5m panelled with 38X89/64mm framing and RSI 2.1/1.4 glass fibre batts full depth, 5m adjoins second slab-on-grade addition, 16m is 0.8m wall of crawl space with 25mm rigid expanded polystyrene insulation, 15m of perimeter is uninsulated (19 square metres of main basement floor area is open cistern).
Doors:	3 @ wood doors, one of which with a wood storm door. 1 DG-type sliding patio dual door unit.
Windows:	all DG vinyl sliders except 1 sealed unit (12mm spacing) in living room.
Air change:	0.21 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	original oil furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary electric baseboard heaters in addition and basement.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 22 C, 56 h/wk @ 20.5 C; winter basement temp. approx. 18 C.
Humidity:	moderate winter levels, some condensation and mould growth, no humidifier, dryer vented outdoors, summer house dehumidification due to cistern.
Remarks:	house expanded to accommodate space requirements of family.

ENERGY RETROFIT

Initial Proposal:	clad exterior walls with 38mm semi-rigid glass fibre, vinyl siding. replace furnace with 15 kW electric furnace with fresh air intake to return air duct. replace 6 DG vinyl sliders with TG casement units. replace 1 door with insulated, steel type.
Audit Findings:	suggested selected air sealing and insulation of exterior foundation perimeter with 50mm extruded polystyrene to 0.6m below grade in conjunction with exterior wall retrofit. door and window replacement not cost effective on energy-saving basis. to be done as above: 2.5X40m ext. walls, 1.3X40m bas't walls: all but slab. to be done with off-oil conversion, fresh air intake: kitchen, bathroom exhaust system.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Exterior main walls and basement	$3635	$3000	$6635	11900	17.8
Seal, caulk, weatherstrip	391	0	391	2300	5.3
Elec. furnace, fresh air, exhaust	1787	450	2237	13400	4.4
Totals	$5813	$3450	$9263	21500	12.6
Change in estimated natural air leakage: 31 % reduction from 0.21 to 0.14 ac/h.					

FILE # ED009

GENERAL DATA

Location:	Winnipeg
Vintage:	1958
Style:	bungalow
Wall type:	wood frame, 66% stucco, 34% wood or stone siding
Basement type:	full, concrete
Floor area:	99 square metres above grade, 95 square metres in basement
Interior volume:	472 cubic metres
Heating system:	natural gas, forced air
Occupants:	6
Occupancy:	likely 1958
Project started:	August 1983
Project completed:	July 1984

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings plus 3 layers of RSI 2.1 glass fibre batts.
Main walls:	double drywall, 38X[illegible]mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.6m above grade. 41m perimeter: 30m with alum. foil against concrete, 25mm air space, and 25mm wood interior finish, 11m uninsulated.
Doors:	1 @ wood with aluminum storm door, 1 @ wood with wood storm door.
Windows:	all DG, sealed units (12mm spacing) in living, dining rooms, metal sliders in kitchen, 3 bedrooms, DG hinged types (6mm spacing) in basement.
Air change:	0.21 ac/h natural, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; wood stove with exterior chimney rarely used, electric heater situated in vicinity.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, dryer vented outdoors.
Remarks:	well-finished basement difficult to upgrade from interior.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows and doors. add 3rd storm pane to all windows. strip stucco, reinsulate wall cavities, sheet with 2 layers of rigid insulation, apply new stucco. insulate exterior of basement walls with rigid extruded polystyrene board to below grade and parge. replace furnace with high-efficiency (approx. 0.90) pulse type.
Audit Findings:	furnace replacement, exterior basement insulation, 3rd pane addition to windows most cost effective, but windows low priority because existing units in good condition. driveway and sidewalk along approx. half of perimeter prevent below-grade application of exterior basement wall insulation in these areas. furnace replacement would include thermostat, fresh air intake, 2-speed fan.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
3rd panes, all windows, 10m^2	$ 716	$ 115	$ 831	3200	16.0
Ext. basement walls, 41m, RSI 1.8	-	-	1725	7200	14.7
Pulse-type furnace, etc.	-	-	2824	11000	15.8
Totals	-	-	$5380	18600	17.8
Change in estimated natural air leakage: 13 % reduction from 0.21 to 0.19 ac/h.					

FILE # ED012

GENERAL DATA

Location:	Winnipeg
Vintage:	1958
Style:	bungalow
Wall type:	wood frame, 85% stucco, 15% wood siding
Basement type:	full, concrete
Floor area:	97 square metres above grade, 91 square metres in basement
Interior volume:	446 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	approx. 1973
Project started:	May 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings plus RSI 3.5 glass fibre batts, well vented.
Main walls:	double drywall, 38X89mm framing and approx. RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade. 41m perimeter: 30m with panelling, 38X89mm framing, and RSI 2.1 glass fibre batts full height including header areas, 11m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG, single fixed or hinged types plus wood storms in living room and basement, remainder are DG aluminum horizontal sliders.
Air change:	0.15 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace more than 20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels moderate, no humidifier, dryer vented outdoors.
Remarks:	newer bungalow in good condition, furnace corroding, due for replacement.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip attic access, basement header areas and windows. replace 3-section living room window with TG unit, 3 basement DG sliders. replace 4 doors with steel, insulated types and aluminum storms. frame, drywall, and insulate remaining portion of basement wall to RSI 2.1. seal penetrations, add RSI 3.2 blown-in loosefill cellulose to attic, install 4 soffit vents. replace furnace with high-efficiency (approx. 0.90) condensing type, setback thermostat, 2-speed fan, fresh air intake to return air duct. other: car plug timer.
Audit Findings:	relatively low energy consumption already. most favourable components are basement insulation and furnace replacement. attic upgrade marginally cost effective because of existing high RSI value. window and door replacement not advised on the basis of energy conservation; excellent overall condition of windows except single-plus-storm types.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Liv. rm/TG/3.7m^2, basement/DG/0.8m^2	-	-	$1230	500	147.7
Basement walls, 11m, RSI 2.1	-	-	517	4700	6.8
Attic as above, 97m^2, add RSI 3.2	-	-	610	1900	19.2
Condensing furnace, etc., as above	-	-	2860	8600	20.3
Totals	-	-	$5217	13800	23.2

Change in estimated natural air leakage: -23 % reduction from 0.15 to 0.18 ac/h (new fresh air intake).

FILE # ED024

GENERAL DATA

Location:	Winnipeg
Vintage:	1961 (est.)
Style:	bungalow
Wall type:	wood frame, 70% stucco, 30% wood siding
Basement type:	full, concrete
Floor area:	90 square metres above grade, 85 square metres in basement, 6 square metre attached greenhouse.
Interior volume:	432 cubic metres
Heating system:	natural gas, forced air
Occupants:	4-5
Occupancy:	July 1978
Project started:	May 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	125mm wood shavings plus RSI 1.4 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 glass fibre batts with blown-in cellulose fibre.
Basement:	full beamfill, 0.9m above grade. 38m perimeter: 19m panelled, framed, and insulated with approx. 64mm glass fibre batts, 19m uninsulated.
Doors:	2 @ wood with wood storm doors, 1 door from bedroom to greenhouse.
Windows:	mainly TG units of varying descriptions in house (often DG with 3rd storm pane), some DG single-plus-storm types, mainly DG sealed units in greenhouse, some TG.
Air change:	0.31 ac/h natural, bathroom and kitchen exhaust fans.
Heating equipment:	gas conversion burner (orig. oil), assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ avg. 17 C; winter basement temp. approx. 17 C.
Humidity:	winter levels high due to lower temp. settings, contents of greenhouse, number of occupants.
Remarks:	various minor conservation projects have been completed by homeowners.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip in conjunction with double-wall retrofit (add RSI 5.3) above grade and to 0.6m below grade and attic upgrade to at approx. RSI 8.8. remove natural gas furnace and DHW tank, replace with electric duct heater and DHW tank; add ventilation/heat recovery system. replace entry doors with insulated type. seal greenhouse and install moveable, insulated panels therein.
Audit Findings:	no cost advantage in gas-to-electric conversion. homeowner to fund 10 kW electric furnace, air-to-air heat exchanger. overall project would have poor expected payback period due to low existing energy consumption and high cost of exterior wall upgrading. double-wall project would include moving of some services. homeowner to add 50mm extruded polystyrene skirt 0.6m wide to new wall base.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Air seal in attic, doors, windows	$ 229	$ 0	$ 229	-	-
Double wall, 36X3.5m, add RSI 5.6 + Basement exterior skirt, RSI 1.8	4412	4557	8969	21500	25.6
Upgrade attic, 85m^2, add RSI 3.5	327	0	327	2700	7.3
Totals	$4968	$4557	$9525	23900	24.4

Change in estimated natural air leakage: 32 % reduction from 0.31 to 0.21 ac/h.

FILE # ED028

GENERAL DATA

Location:	Winnipeg
Vintage:	1950-55
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	99 square metres above grade, 95 square metres in basement
Interior volume:	466 cubic metres
Heating system:	natural gas, forced air
Occupants:	1
Occupancy:	July 1973
Project started:	June 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	140mm wood shavings between joists plus RSI 2.1 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.75m above grade, 41m perimeter uninsulated.
Doors:	1 @ wood with aluminum storm door, 1 @ wood with wood storm door.
Windows:	all DG aluminum vertical or horizontal sliding units except basement single-plus-storm units and sealed unit (12mm spacing) in living room.
Air change:	0.17 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil), assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	electric.
Temp. settings:	54 h/wk @ 20 C, 114 h/wk @ 15.5 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low.
Remarks:	Single occupant; little appliance, DHW use, or moisture production.

ENERGY RETROFIT

Initial Proposal:
- seal, caulk, weatherstrip entire house by homeowner.
- install interior 3rd glazing on living room DG unit, weatherstrip remaining metal sliders.
- replace 4 basement windows and frame, drywall, and insulate basement walls to RSI 3.5 level.

Audit Findings:
- basement wall crack would have to be repaired and moisture-proofed before construction of insulated basement frame walls could be commenced.
- unnecessary to replace basement windows: to weatherstrip is appropriate.
- attic insulation upgrade is suggested: add RSI 3.5 (loosefill glass fibre proposed by contractor).

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal, caulk, weatherstrip	$ 360	$ 0	$ 360	1000	23.0
Attic upgrade, 99m^2, add RSI 3.5	405	145	550	2300	14.9
Basement walls, 41m, RSI 3.5	-	-	1990	23500	5.2
Totals	-	-	$2900	26600	6.7

Change in estimated natural air leakage: -1% reduction from 0.17 to 0.17 ac/h.

FILE # ED052

GENERAL DATA

Location:	Winnipeg
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, 68% stucco, 32% aluminum siding over stucco
Basement type:	full, concrete
Floor area:	109 square metres above grade, 105 square metres in basement
Interior volume:	522 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	April 1961
Project started:	July 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	approx. 50mm wood shavings plus RSI 2.1 glass fibre batts to tops of joists.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 1.0m above grade. 44m perimeter: 22m with panelling, 38X89mm framing, and RSI 2.1 glass fibre batts, 22m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG sashless sliders except single-wood-plus-storm type in basement, 4 DG sealed units (12mm spacing) and 1 TG fixed/awning unit in living room.
Air change:	0.29 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney; incinerator unit which uses same chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20.5 C, 56 h/wk @ 10 C; winter basement temp. approx. 16.5 C.
Humidity:	winter levels low, humidifier not used, dryer vented outdoors.
Remarks:	home in excellent condition, air leakage relatively low despite window type.

ENERGY RETROFIT

Initial Proposal:
weatherstrip 2 main doors and 2 storms.
replace all main floor windows with TG units.
frame and insulate remaining portion of basement wall to RSI 2.1 level.
add 1 more layer of RSI 2.1 glass fibre batts to attic.
replace furnace with high-efficiency (approx. 0.90) condensing type.

Audit Findings:
window replacement not cost effective, even allowing for large reduction in air infiltration.
other components appropriate, particularly the furnace replacement, in light of the age of the existing unit.
reasonable insulation levels for basement and attic upgrading proposals would be RSI 3.5 rather than RSI 2.1.
high-RSI-value rigid insulation to be used in crowded area near furnace.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Weatherstrip 4 doors	$ 50	$ 50	$ 100	-	-
Basement walls, 22m, RSI 3.5	661	660	1321	12400	6.6
Attic upgrade, 109m^2, add RSI 3.5	387	0	387	4000	5.9
Condensing furnace, thermostat	-	-	3047	14500	12.9
Totals	-	-	$4855	26300	11.3

Change in estimated natural air leakage: -8 % reduction from 0.29 to 0.31 ac/h (windy test conditions).

FILE # ED062

GENERAL DATA

Location:	Winnipeg
Vintage:	1956
Style:	bungalow
Wall type:	wood frame, 83% stucco, 17% wood siding
Basement type:	full, concrete
Floor area:	91 square metres above grade, 86 square metres in basement
Interior volume:	426 cubic metres
Heating system:	electric, forced air
Occupants:	2
Occupancy:	approx. 1963
Project started:	July 1983
Project completed:	July 1984

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings plus approx. 325mm blown-in loosefill glass fibre.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.75m above grade. 39m perimeter: in header area, 22m is insulated with RSI 1.4 glass fibre batts, 17m is uninsulated, and below header, 11m is panelled, framed, and insulated with RSI 2.1 glass fibre batts, 28m is uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	TG sealed and awning units in kitchen and bathroom, remainder various DG wood sealed, opening, and small slider types.
Air change:	0.30 ac/h natural, kitchen fan and fresh air intake to return air duct.
Heating equipment:	electric furnace approx. 10 years old, old central chimney blocked off.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 19 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to medium, no humidifier, dryer vented indoors.
Remarks:	house in excellent condition.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. resheet exterior walls with 75mm rigid extruded polystyrene board, extending to below grade, apply stucco finish. frame and insulate remaining portion of basement wall to RSI 3.5 level.
Audit Findings:	discussion as to merits of strapped-wall or double-wall versions of exterior wall retrofit vs. method proposed, also merits of the various types of rigid insulation: doubtful cost effectiveness for all such projects in a region of low energy costs. ultimate proposal includes stripping stucco, adding RSI 1.4 batts to existing in cavities, wrapping electrical penetrations, sheeting with 75mm foil-faced polyurethane board to 0.15m below grade, stucco finish. sealing and basement proposals reasonable, complementary to wall project. homeowner to fund and perform air sealing work (lower priority) in order to keep total project cost below programme maximum.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Walls, 40X3.4m, to RSI 6.3 level + Int. basement walls, 28m, RSI 3.5	-	-	$8687	14700	21.8
Totals	-	-	$8887	14700	21.8
Change in estimated natural air leakage: -6% reduction from 0.30 to 0.32 ac/h (2nd test done without stucco having been applied).					

FILE # ED063

GENERAL DATA

Location:	Winnipeg
Vintage:	1955-60
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	84 square metres above grade, 81 square metres in basement
Interior volume:	405 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	April 1982
Project started:	August 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings and 6mm loosefill cellulose fibre.
Main walls:	double drywall, 38X89mm framing with approx. RSI 1.2 glass fibre batts.
Basement:	full beamfill, 0.7m above grade, 37m perimeter uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG, hinged units (12mm spacing) in basement, 3 sealed units (8mm spacing) in living room, remainder fixed/awning combination units (12mm spacing).
Air change:	0.17 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 15.5 C.
Humidity:	winter levels medium to high, no humidifier, dryer vented outdoors.
Remarks:	house quite airtight, contains 4 occupants and plants: high humidity levels.

ENERGY RETROFIT

Initial Proposal:
- replace living room 3-lite window with TG units, upgrade storm panes of 2 other windows.
- drywall, frame, and insulate basement walls to RSI 3.5 level.
- upgrade attic insulation to RSI 7.0 level with loosefill glass fibre, add wind-powered vent.

Audit Findings:
- very little upgrading to date on this house: expected simple payback periods favourable as a result.
- addition of 3rd storm panes to living room windows more cost effective than replacement because existing window in good condition: experiences condensation because of narrow spacing between panes (lower RSI value).
- opportunity should be taken to seal ceiling penetrations before insulating; proposed to seal, add RSI 5.3 cellulose fibre, 1 roof vent.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Living room 3rd panes, 3.9m^2	$ 259	$ 0	$ 259	1100	13.9
Basement walls, 37m, RSI 3.5	821	0	821	18700	2.7
Attic upgrade, 84m^2, add RSI 5.3	407	189	596	7000	5.3
Fresh air intake	55	100	155	-	-
Totals	$1542	$ 289	$1831	26600	4.2

Change in estimated natural air leakage: -16 % reduction from 0.15 to 0.19 ac/h (new fresh air intake).

FILE # ED065

GENERAL DATA

Location:	Balmoral
Vintage:	1950 (est.)
Style:	bungalow (2 houses joined together)
Wall type:	wood frame, stucco
Basement type:	full, concrete block
Floor area:	105 square metres above grade, 94 square metres in basement
Interior volume:	430 cubic metres
Heating system:	propane, forced air
Occupants:	3
Occupancy:	November 1974 (house moved onto new foundation)
Project started:	September 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	RSI 3.5 glass fibre batts on top of old flat roof which has had a pitched roof built over it; soffit and wind-powered vents.
Main walls:	25mm drywall, 38X89mm framing with approx. RSI 1.2 batts, wax paper v.b.
Basement:	ranges from 0.6 to 0.9m above grade, header area uninsulated. 39m perimeter: 19m with 38mm expanded polystyrene board down 1.2m from joists and uninsulated below this, 20m with 38X89mm framing and RSI 2.1 batts full height plus 38mm exp. polystyrene down 1.2m from joists.
Doors:	1 @ steel, insulated door, 1 @ hollow wood door, no storms.
Windows:	all DG, 8 vinyl sliders and 3 sealed units (15mm spacing).
Air change:	0.57 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional propane gas furnace (new in 1982 [off-oil]), assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 17 C.
Humidity:	winter levels low, no window condensation, no humidifier, dryer vented outdoors.
Remarks:	2 houses joined together in 1974; major new addition to house planned.

ENERGY RETROFIT

Initial Proposal:	replace 6 sliders with TG units, back door with steel, insulated type. add 38X140 framing and RSI 3.5 glass fibre batts to 3 exterior walls, stucco (4th side to be renovated regardless, including construction of 5m heavily insulated addition). frame and insulate, with RSI 2.1 batts, remaining poorly insulated portion of basement wall, incl. space below rigid material. add RSI 5.3 in glass fibre batts to attic.
Audit Findings:	conversion from propane to electric heating system reasonable from cost of energy standpoint, but loss associated with abandoning of new propane furnace must be considered. for age, house quite leaky to air flow (foundation, junctions between the two houses likely part of the problem): air sealing effort suggested. wall and window retrofit not cost effective with respect to energy saved.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 265	$ 660	$ 925	4200	6.6
Door replacement	345	100	445	700	18.8
Basement walls, 19m, RSI 3.5	610	502	1112	6000	5.6
Attic upgrade as above, 105m^2	425	375	800	6400	3.8
Retain furnace, add heat pump	-	-	3500	20000	4.8
Totals	-	-	$6782	30000	6.4

Change in estimated natural air leakage: 5 % reduction from 0.57 to 0.54 ac/h.

FILE # ED070

GENERAL DATA

Location:	Garson
Vintage:	1945-50 (est.)
Style:	bungalow
Wall type:	wood frame, 85% stucco, 15% wood siding
Basement type:	full, concrete block
Floor area:	63 square metres above grade, 58 square metres in basement
Interior volume:	297 cubic metres
Heating system:	electric, forced air
Occupants:	3
Occupancy:	1977
Project started:	August 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	200mm loosefill glass fibre insulation.
Main walls:	32m perimeter: shiplap both sides, 38X89mm framing, 14m with approx. RSI 1.2 batts, 18m uninsulated.
Basement:	0.5m above grade, header areas insulated with RSI 3.5 glass fibre batts. 31m perimeter: drywall finish with 38X89mm framing and RSI 2.1 glass fibre batts (early 1983).
Doors:	2 @ wood with wood storm doors.
Windows:	all DG fixed and single-hung with storm types.
Air change:	0.28 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	electric furnace.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 16 C.
Humidity:	winter levels moderate, dryer vented outdoors.
Remarks:	house moved onto site in 1961, and is made up of a small older building with a newer addition likely built at that time.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by contractor.
add 3rd panes to all windows; replace 2 doors with steel, insulated type.
insulate walls by opening from exterior, installing vapour barrier and RSI 2.1 glass fibre batts in each cavity and covering with 38mm semi-rigid glass fibre sheathing and stucco.
upgrade basement insulation.
raise level of attic insulation to RSI 7.0 after sealing penetrations.
install ventilation system with heat recovery, some fluorescent lights.

Audit Findings:
suggested basement insulation could be 38mm extruded polystyrene to match dimensions of main walls; decided to do this down to grade plus pour vermiculite into block cavities.
trial with interior magnetic-type 3rd panes unsatisfactory due to child: decided to install exterior storms instead.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 165	$ 95	$ 260	800	12.4
Picture window, 3rd panes, 6m^2	1150	200	1350	1100	42.5
Main walls, 2.4X32m, RSI 2.1+1.2	2516	3570	6086	18100	12.2
Basement walls, 0.5X31m, add RSI 1.3	655	650	1305	300	186.2
Attic upgrade, 63m^2, add RSI 3.8	250	350	600	1600	13.4
Totals	$4736	$4865	$9601	20500	16.9

Change in estimated natural air leakage: -111 % reduction from 0.28 to 0.58 ac/h (aluminum siding replaces original stucco, some new window frames not sealed at time of test, final test performed under gusty conditions).

FILE # ED073

GENERAL DATA

Location:	Winnipeg
Vintage:	1963
Style:	bungalow
Wall type:	wood frame, 70% stucco, 30% field stone
Basement type:	full, concrete
Floor area:	92 square metres above grade, 88 square metres in basement
Interior volume:	441 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1963
Project started:	June 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	140mm wood shavings between joists and 1 layer of RSI 2.1 glass fibre batts.
Main walls:	double drywall, 38X89mm framing with approx. RSI 1.2 batts, additional 50mm extruded polystyrene board under field stone on 6m north wall section.
Basement:	full beamfill, 0.75m above grade, 39m perimeter; header areas: 10m with RSI 1.2 glass fibre batts, 29m uninsulated. below headers: 30m panelled, framed, and insulated with RSI 1.2 glass fibre batts, 9m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	4 DG basement single-plus-storm types, 3-lite living room window DG sealed unit with 3rd storm pane, remainder TG aluminum sliders.
Air change:	0.24 ac/h natural, kitchen range exhaust fan not used in winter, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; wood stove with exterior chimney used occasionally.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 20.5 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, humidifier sometimes used, gas dryer vented outdoors.
Remarks:	home in excellent condition, exterior upgrade on north side prevented by stone work, already low energy consumption.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows, doors, bottom of stucco. replace doors with steel, insulated type. double-wall retrofit to 3 walls, add RSI 5.6. drywall, frame, and insulate 8.0m of basement wall to RSI 4.2 level. add RSI 3.5 glass fibre batts to attic, along with 3 vents.
Audit Findings:	attic, basement, and double-wall components together would achieve programme requirement for annual total energy savings percentage but with poor payback due to cost of double-wall retrofit, unit energy cost, and current low total energy consumption in the house. opportunity should be taken to install fresh air intake to return air duct and, if house likely to be much tighter, a combustion air supply. homeowner to retain one door and to replace side door only.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Replace 1 door, weatherstrip both	-	-	$ 402	500	45.3
Double wall, 28X3.5m, add RSI 5.6	-	-	7125	16600	26.4
Basement walls, 8m, RSI 4.2	-	-	530	5200	6.3
Attic upgrade, 92m^2, add RSI 3.5	$ 320	$ 0	320	2200	8.9
Totals	-	-	$8377	19200	26.8

Change in estimated natural air leakage: 19 % reduction from 0.24 to 0.20 ac/h.

FILE # ED096

GENERAL DATA

Location:	Winnipeg
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, 71% stucco, 14% wood siding, 15% brick
Basement type:	full, concrete
Floor area:	89 square metres above grade, 85 square metres in basement
Interior volume:	426 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	1972
Project started:	August 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	wood shavings plus blown-in cellulose fibre to RSI 7.0 level.
Main walls:	double drywall, 38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.6m above grade, header areas uninsulated. 38m perimeter: 20m panelled and framed with RSI 1.4 glass fibre batts, 18m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG, single-plus-storm type in basement, sealed units in living room and one bedroom, remainder fixed and awning types with removable inner pane (approx. 25mm spacing).
Air change:	0.16 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; natural gas swimming pool heater.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 18 C; winter basement temp. approx. 17 C.
Humidity:	winter levels medium to high, no humidifier, dryer vented indoors.
Remarks:	annual natural gas consumption more than twice expected amount for house of this type: swimming pool heater is the culprit; electricity consumption also unusually high.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. upgrade exterior wall insulation by blowing in loosefill glass fibre (drill and patch stucco). insulate/reinsulate basement walls from interior by adding RSI 3.5/2.1 batts and installing/moving framing and panelling as applicable.
Audit Findings:	full air seal unnecessary due to existing airtightness, wall reinsulation inappropriate because cavities already partly filled with batts and exterior finish is in excellent condition. furnace replacement with high-efficiency (approx. 0.90) condensing type suggested because of age of existing unit. fresh air intake and exterior dryer vent suggested for humidity control.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal ceiling, weatherstrip doors	$ 38	$ 62	$ 100	-	-
Basement walls, 38m, RSI 3.5	873	1144	2017	9200	13.5
Condensing furnace, fresh air duct	1681	820	2501	8800	17.5
Totals	$2592	$2026	$4618	15400	18.4

Change in estimated natural air leakage: -4 % reduction from 0.16 to 0.17 ac/h (prior to fresh air intake installation).

FILE # ED116

GENERAL DATA

Location:	Winnipeg
Vintage:	1956 (est.)
Style:	bungalow
Wall type:	wood frame, 70% stucco, 30% field stone
Basement type:	full, concrete
Floor area:	92 square metres above grade, 87 square metres in basement
Interior volume:	429 cubic metres
Heating system:	natural gas, forced air
Occupants:	2 (3rd expected)
Occupancy:	September 1976
Project started:	December 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	90mm wood shavings plus 70mm loosefill cellulose fibre to just above joists with a partial layer of RSI 1.4 glass fibre batts.
Main walls:	double drywall, 38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.9m above grade, header areas uninsulated. 39m perimeter: 19m panelled, 38X64mm framing, uninsulated, 20m uninsulated.
Doors:	1 @ wood with wood storm door, 1 @ wood with aluminum storm door.
Windows:	all DG, basement windows single-plus-storm type with all but one having 50mm expanded polystyrene board between the panes, living room has 3-lite sealed type, remainder alum. sliders; large living room and bedroom windows have fixed exterior awning with high winter shading.
Air change:	0.23 ac/h natural, kitchen and bathroom exhaust fans, no fresh air intake to return air duct.
Heating equipment:	gas conv. unit (orig. oil), assumed seasonal efficiency 0.65, ext. chimney.
Domestic hot water:	natural gas.
Temp. settings:	105 h/wk @ 20 C, 63 h/wk @ 18 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low to medium, humidifier used, dryer vented outdoors.
Remarks:	modernized, but energy conservation in the attic and basement is possible.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace 4 basement windows, install 3rd pane on 8 windows. replace main front door and rear storm door. double-wall retrofit to 3 exterior walls, add RSI 4.9. insulate entire basement perimeter from interior to RSI 3.5 level. increase attic insulation and ventilation levels. replace furnace with energy-efficient type, add air-to-air heat exchanger.
Audit Findings:	components proposed together exceed programme allowable maximum budget. homeowner unsure of priorities. basement walls, attic upgrade, furnace replacement appropriate and cost effective, remaining proposed items unreasonable at this time. preferred furnace is high-efficiency (approx. 0.90) pulse type. suggest modification of south awnings (or replacement) to retractable type.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 39m, RSI 3.5	$1072	$1415	$2487	14000	10.9
Attic, 92m^2, add RSI 3.5 batts	356	0	356	3500	6.3
Pulse-type furnace, fresh air duct	2160	565	2725	11400	14.6
Retractable awnings	125	198	323	600	31.1
Totals	$3713	$2178	$5891	24400	14.8
Change in estimated natural air leakage:	2 % reduction from 0.23 to 0.22 ac/h (new fresh air intake).				

FILE # ED127

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	bungalow
Wall type:	wood frame, stucco covered with aluminum siding
Basement type:	full, concrete
Floor area:	88 square metres above grade, 79 square metres in basement
Interior volume:	407 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	September 1980
Project started:	July 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	wood shavings and loosefill glass fibre to approx. RSI 5.8.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, header areas uninsulated. 37m perimeter: 5m with fibreboard panelling, 38X38mm framing, and empty cavities, 32m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG, fixed and single-hung wood types with wood or aluminum storms.
Air change:	0.46 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace approx. 20 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 19 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low, no humidifier, dryer vented indoors.
Remarks:	combination of air leakage and lack of insulation results in uncomfortably cold basement in winter.

ENERGY RETROFIT

Initial Proposal:	frame and insulate basement walls to RSI 3.5 level. replace furnace with high-efficiency (approx. 0.90), condensing type.
Audit Findings:	airtightness lower than normal for house type and age: suggest complete air leakage sealing, and a fresh air intake in conjunction with furnace replacement. basement and furnace proposals reasonable. foundation wall cracks to be sealed before basement insulated. homeowner to attempt air sealing work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 106	$ 0	$ 106	4100	1.6
Basement walls, 37m, RSI 3.5	1043	752	1795	16400	6.7
Furnace, duct, thermostat	1977	450	2427	12200	12.2
Totals	$3127	$1202	$4329	26900	9.9

Change in estimated natural air leakage: 18 % reduction from 0.46 to 0.38 ac/h (new fresh air intake included).

FILE # ED130

GENERAL DATA

Location:	Winnipeg
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, 75% stucco, 8% brick, 17% wood siding
Basement type:	full, concrete
Floor area:	84 square metres above grade, 79 square metres in basement
Interior volume:	398 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	July 1975
Project started:	September 1983
Project completed:	July 1984

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings, 65mm loosefill cellulose fibre, 1 layer of RSI 3.5 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.6m above grade. 36.5m perimeter: 34.5m framed and panelled, 18m with RSI 1.2 and 2.1 batts, 16.5m with RSI 1.2 batts only, 2m portion uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	4 basement windows DG vinyl sliders, 3 of which have 3rd aluminum storm pane, remainder DG aluminum sliders except for DG 3-lite sealed living room window with interior moveable 3rd pane (12mm spacings).
Air change:	0.19 ac/h natural, basement bathroom exhaust fan, fresh air intake to return air duct.
Heating equipment:	original conventional natural gas furnace, assumed seasonal efficiency 0.65, exterior chimney; main and basement fireplaces with exterior chimney used only occasionally.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 19 C; winter basement temp. approx. 19 C.
Humidity:	winter levels moderate, no humidifier, dryer vented outdoors.
Remarks:	spring and fall backdraughting of chimney when fireplace used.

ENERGY RETROFIT

Initial Proposal:	replace main floor windows with TG units. replace main doors with steel, insulated type, storms with new wood storms. sheet north main wall and part of west wall with 50mm rigid polyurethane board and restucco. insulate remaining portion of basement wall to RSI 2.1 level. replace furnace with high-efficiency (approx. 0.83), induced-draught type. other: fireplace chimney cap and glass doors.
Audit Findings:	main walls, basement, furnace components marginally cost effective, other components worse. fireplace chimney responsible for significant air leakage, draughts. furnace preference changed to high-efficiency (approx. 0.90) pulse type. wall proposal: fireplace chimney would be covered with insulation.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Exterior 3rd panes, 7.8m^2	$ 741	$ 0	$ 741	1200	36.5
Walls, 16X2.6m, add RSI 2.9	1549	649	2198	4700	28.5
Basement walls, 2m, RSI 2.1	44	-	44	1400	1.9
Pulse-type furnace, thermostat	-	-	2736	6800	24.7
Totals	-	-	$5718	12100	29.1
Change in estimated natural air leakage:	3 % reduction from 0.19 to 0.19 ac/h.				

FILE # ED137

GENERAL DATA

Location:	Winnipeg
Vintage:	1962
Style:	bungalow
Wall type:	wood frame, 78% stucco, 10% wood siding, 12% brick
Basement type:	full, concrete
Floor area:	85 square metres above grade, 80 square metres in basement
Interior volume:	391 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	November 1982
Project started:	August 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings between joists.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, 37m perimeter uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG, single wood plus wood storms in basement, fixed wood units in living room and kitchen, remainder single-hung type with aluminum storms.
Air change:	0.19 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 18 C, occasionally weekend settings of 10 C; winter basement temp. approx. 15 C.
Humidity:	winter levels medium, some window condensation and freezing, humidifier not used, no dryer installed.
Remarks:	very little has been changed in this house since the date of construction.

ENERGY RETROFIT

Initial Proposal: seal, caulk, weatherstrip entire house by homeowner.
replace main floor windows with TG units.
frame and insulate basement wall to RSI 3.5 level.
seal attic and insulate with blown-in cellulose fibre to RSI 7.0, add vents.

Audit Findings: proposal components reasonable except for window replacement: existing units in adequate condition, minor condensation problems in winter and subsequent mould growth likely a function of low temp. settings and airtightness; this could worsen if house made tighter and occupants spend more time at home.
homeowners interested in ventilation system with heat recovery, controlled by a de-humidistat and with manual overrides: air seal would be comprehensive type, done by contractor.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 320	$ 354	$ 674	1400	28.8
Basement walls, 37m, RSI 3.5	842	824	1666	16100	6.3
Attic upgrade, 85m^2, add RSI 6.0	519	226	745	11400	4.0
Air-to-air heat exchanger, system	1260	690	1950	-	-
Totals	$2941	$2094	$5035	28000	11.0

Change in estimated natural air leakage: 29 % reduction from 0.19 to 0.13 ac/h (with ventilation system, resulting natural ac/h is augmentable as required).

FILE # ED166

GENERAL DATA

Location:	Winnipeg
Vintage:	1956
Style:	bungalow
Wall type:	wood frame, 83% stucco, 17% wood siding
Basement type:	full, concrete
Floor area:	82 square metres above grade, 79 square metres in basement
Interior volume:	382 cubic metres
Heating system:	natural gas, forced air
Occupants:	5
Occupancy:	June 1976
Project started:	November 1983
Project completed:	June 1984

PRE-PROJECT HOUSE

Ceilings:	140mm wood shavings to tops of joists.
Main walls:	double drywall, 38X89mm framing with approx. RSI 1.2 batts.
Basement:	joists, headers on sill plate, 0.7m above grade, header areas insulated with kraft-backed RSI 1.2 glass fibre batts. 37m perimeter: 21.5m with 44X125mm planks placed flat against concrete wall as furring for plywood panelling finish, no insulation in 44mm air space, 15.5m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG aluminum sliders except TG 3-lite wood sealed unit (12mm spacings) in living room.
Air change:	0.28 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; two 1.5 kW electric heaters in basement used rarely.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to medium, humidifier not used.
Remarks:	unusual foundation-header style for house type, age, and region: significant portion of higher than average overall air leakage is at header areas.

ENERGY RETROFIT

Initial Proposal:	replace doors with steel, insulated type and weatherstrip them. minor interest in exterior wall retrofit, realizes high cost, poor payback. insulate/reinsulate entire basement wall if necessary. upgrade level of attic insulation. replace old furnace with high-efficiency type. minor interest in air-to-air heat exchanger if appropriate.
Audit Findings:	homeowner unsure of priorities. attic upgrade, entire basement wall insulation, furnace replacement are reasonable retrofit components, along with selected air sealing. preferred basement option: to do only the unpanelled portion. preferred attic option: to add RSI 5.3 blown-in cellulose fibre, air chutes, soffit vents, wind-powered vent. preferred furnace: high-efficiency (approx. 0.90) pulse type.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 108	$ 0	$ 108	-	-
Basement walls, 15.5m, RSI 3.5	465	0	465	9400	3.0
Attic upgrade, 82m^2, add RSI 5.3	526	282	808	5800	8.6
Pulse-type furnace	2295	735	3030	10300	18.1
Totals	$3394	$1017	$4411	19200	14.1
Change in estimated natural air leakage: 27 % reduction from 0.28 to 0.21 ac/h.					

FILE # ED183

GENERAL DATA

Location:	Winnipeg
Vintage:	1960-65 (est.)
Style:	bungalow
Wall type:	wood frame, 67% stucco, 15% stone, 18% wood siding
Basement type:	full, concrete
Floor area:	104 square metres above grade, 100 square metres in basement
Interior volume:	496 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	December 1982
Project started:	July 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	150mm wood shavings, approx. 30% of area with additional layer of RSI 3.5 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.9m above grade, 45m perimeter uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG, hinged units (25mm spacing) in basement, remainder aluminum sliders except living room sealed unit (6mm spacing).
Air change:	0.15 ac/h natural, bathroom exhaust fan, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 22.5 C, 56 h/wk @ 20.5 C; winter basement temp. approx. 17 C.
Humidity:	winter levels moderate, some condensation on windows, humidifier used rarely, dryer vented outdoors.
Remarks:	example of an almost unaltered house with significant energy-conservation potential.

ENERGY RETROFIT

Initial Proposal: seal, caulk, weatherstrip entire house by contractor.
frame and insulate basement to RSI 2.1 level.
install RSI 5.6 in attic using blown-in loosefill glass fibre, add vents.

Audit Findings: appropriate level for basement walls is RSI 3.5, otherwise proposed components are the reasonable ones.
air sealing will not save much energy because house already tight, but advisable, along with fresh air intake, to control possible moisture problems.
furnace upgrading is a possibility, but existing unit in good operating condition.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 348	$ 348	$ 696	1100	39.6
Basement walls, 45m, RSI 3.5	1110	962	2072	22800	5.6
Attic upgrade, 104m^2, add RSI 5.6	726	340	1066	5200	12.6
Fresh air intake	25	75	100	-	-
Totals	$2209	$1725	$3934	28600	8.4

Change in estimated natural air leakage: -4 % reduction from 0.15 to 0.15 ac/h.

FILE # ED184

GENERAL DATA

Location:	Thompson
Vintage:	1967
Style:	bi-level (split-entry)
Wall type:	wood frame, wood siding
Basement type:	full, concrete block
Floor area:	95 square metres above grade, 86 square metres in basement
Interior volume:	528 cubic metres
Heating system:	propane, forced air
Occupants:	4
Occupancy:	August 1981
Project started:	September 1983
Project completed:	October 1984

PRE-PROJECT HOUSE

Ceilings:	90mm wood shavings covered with RSI 3.5 glass fibre batts; adequate vents.
Main walls:	38X89mm framing with RSI 1.8 glass fibre batts, drywall.
Basement:	1.3m above grade, header areas uninsulated. 38m perimeter: 38X89mm framing insulated to floor with RSI 2.1 batts. pressure-treated wood floor above heated crawl space which is 0.8m high from the soil to the subfloor.
Doors:	2 @ wood doors with wood storm doors.
Windows:	4 DG aluminum sliders (one covered with 25mm expanded polystyrene in winter), 8 TG units (mixture of sealed and sealed/casement combos.).
Air change:	0.22 ac/h natural, no exhaust fans, fresh air intake to return air duct.
Heating equipment:	original conventional propane gas furnace, assumed seasonal efficiency 0.65, interior chimney, only used to circ. heat from wood stove which uses exterior chimney; supplementary kerosene space heater.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20.5 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels moderate to high with window condensation occurring, previous mould growth, dryer vented outdoors, portable humidifier 1 month/year.
Remarks:	back basement wall exposed above grade due to excavation in back yard.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. replace DG sliders with TG units (mainly sealed/casement types). replace doors with steel, insulated type and wood storms with alum. type. replace existing propane furnace with electric furnace, upgrade service.
Audit Findings:	air sealing in selected areas in the upper envelope area may be advisable to prevent possible moisture related problems within the structure. door upgrading not cost effective. lower level window frames in poor condition, allowing significant infiltration, and should be replaced: opportunity to install TG units. for humidity control and air requirements: careful use of damper on fresh air intake, possible installation of combustion air duct to wood stove, possible requirement for exhaust fans or central exhaust serving critical areas (kitchen, bathroom).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 343	$ 0	$ 343	2200	4.5
TG windows, $5m^2$	1681	277	1958	2800	20.1
15 kW electric furnace, service	948	300	1248	15600	1.7
Misc., exhaust fan, comb. air duct	297	195	492	-	-
Totals	$3268	$ 772	$4040	17800	5.1

Change in estimated natural air leakage: 26 % reduction from 0.22 to 0.16 ac/h (0.12 with combustion air duct sealed).

FILE # ED205

GENERAL DATA

Location:	Winnipeg
Vintage:	1960
Style:	bungalow
Wall type:	wood frame, 72% stucco, 14% wood siding, 14% brick
Basement type:	full, concrete
Floor area:	94 square metres above grade, 91 square metres in basement
Interior volume:	440 cubic metres
Heating system:	natural gas, forced air
Occupants:	1
Occupancy:	September 1980
Project started:	September 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	150mm wood shavings plus RSI 3.5 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.7m above grade, 41m perimeter uninsulated.
Doors:	1 @ wood with aluminum storm door, 1 @ wood with wood storm door.
Windows:	all DG, basement hinged type (12mm spacing), remainder fixed, awning, and casement types (6mm spacing), except living room fixed/slider unit (12mm spacing).
Air change:	0.23 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 19.5 C, 56 h/wk @ 13 C; winter basement temp. approx. 13 C.
Humidity:	winter levels moderate, humidifier not used, dryer vented outdoors.
Remarks:	home in excellent condition.

ENERGY RETROFIT

Initial Proposal: seal, caulk, weatherstrip entire house by contractor.
interior 3rd panes on all main level windows.
frame, insulate to RSI 3.5, and drywall basement walls.
replace furnace with medium-efficiency (approx. 0.75) type (spark ignition, vent damper) and setback thermostat.

Audit Findings: air seal not expected to save much energy because house already tight, but selected sealing advisable along with fresh air intake for control of humidity levels.
fresh air intake to be included in furnace work: to utilize make-up air controller operated by pressure in supply-air duct.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Interior 3rd panes, 5.3m^2	$ 510	$ 285	$ 795	1700	28.3
Basement walls, 41m, RSI 3.5	1643	752	2395	17600	8.4
Furnace, duct, thermostat	1285	330	1615	5600	17.7
Totals	$3438	$1367	$4805	22300	13.2

Change in estimated natural air leakage: -22 % reduction from 0.23 to 0.27 ac/h (new fresh air intake).

FILE # ED208

GENERAL DATA

Location:	Virden
Vintage:	1955-60 (est.)
Style:	bungalow
Wall type:	wood frame, 20% brick, 40% stucco, 40% wood siding
Basement type:	full, concrete block
Floor area:	94 square metres above grade, 90 square metres in basement
Interior volume:	435 cubic metres
Heating system:	oil, forced air
Occupants:	2
Occupancy:	likely greater than 10 years
Project started:	November 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	150mm loosefill cellulose fibre plus 200mm vermiculite.
Main walls:	38X89mm framing with approx. RSI 1.2 batts and UFFI, except 7m with brick veneer and no UFFI.
Basement:	0.8m above grade, 40m perimeter. header areas: 32m with RSI 1.4 glass fibre batts, 8m uninsulated. below headers: 21m panelled with 38X38mm framing and empty cavities, 8m with 12mm rigid expanded polystyrene with fibreboard cover, 11m uninsulated.
Doors:	1 @ steel, insulated type with aluminum storm door. 1 @ wood with wood storm.
Windows:	mainly DG wood units, a mixture of sliders, fixed, and single-hung with storm types, and 2 TG PVC sliders.
Air change:	0.19 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace, more than 20 years old, assumed seasonal efficiency 0.65, interior chimney; supplementary electric baseboard heater.
Domestic hot water:	electric.
Temp. settings:	unknown.
Humidity:	winter levels likely medium or higher.
Remarks:	removal of UFFI planned: opportunity to increase wall insulation levels.

ENERGY RETROFIT

Initial Proposal:	seal and caulk windows and doors; replace 5 windows with TG units. replace wood door set with metal, insulated type and aluminum storm. after UFFI removal, fur out wall studs, insulate with RSI 3.5 glass fibre batts, apply new siding, and apply 50mm rigid extruded polystyrene to exterior of above grade basement wall. add 50mm rigid extruded polystyrene and cover to interior surface of living room wall where brick prevents exterior wall retrofit. place glass fibre batts between framing in panelled portion of basement, apply 50mm rigid extruded polystyrene to remainder and cover. upgrade electrical service and install electric plenum heater to furnace.
Audit Findings:	38mm extruded polystyrene to be used instead of 50mm, 38mm semi-rigid glass fibre sheathing and RSI 2.1 batts instead of furring out studs. conversion to electric furnace chosen over nat. gas; fresh air intake will likely be required to allow control of humidity levels.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Main walls, 2.4X41m	$2900	$1610	$4510	3400	43.9
Bas't walls (int+ext), 40m, RSI 3.5	2024	1653	3677	13700	8.9
20 kW electric furnace, service	1722	90	1812	12000	4.4
Totals	$6646	$3353	$9999	22200	14.4

Change in estimated natural air leakage: 46 % reduction from 0.19 to 0.10 ac/h (prior to fresh air intake being installed; humidity problem occurring).

NOTES:

C.2.2 1½ Storey Houses

Pre-1945:	ED 022	Winnipeg
	ED 025	Winnipeg
	ED 047	Winnipeg
	ED 048	Duck River
	ED 057	Vogar
	ED 061	Winnipeg
	ED 103	Winnipeg
	ED 199	Ste. Rose du Lac
	ED 228	Winnipeg
	ED 234	Carman
	ED 248	Brandon
1945-70:	ED 041	Winnipeg
	ED 045	Winnipeg
	ED 050	Winnipeg
	ED 094	Winnipeg
	ED 126	Winnipeg
	ED 200	Sanford
	ED 204	Winnipeg
	ED 213	Portage la Prairie
	ED 242	Winnipeg

FILE # ED022

GENERAL DATA

Location:	Winnipeg
Vintage:	1920 (est.)
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	102 square metres above grade, 65 square metres in basement
Interior volume:	416 cubic metres
Heating system:	natural gas, convected air
Occupants:	2
Occupancy:	pre-1981
Project started:	July 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	central attic: 50-75mm vermiculite plus RSI 3.5 glass fibre batts. pitched portions: approx. 100mm rafter spaces filled with sawdust. kneewalls and heated rear porch ceiling: RSI 3.5 glass fibre batts. side attics: 225mm loosefill glass fibre on floorboards, joist spaces empty.
Main walls:	approx. 100mm cavities uninsulated, except RSI 3.5 batts in 140mm rear porch wall cavities and floor.
Basement:	partial beamfill, 0.8m above grade, uninsulated 33m perimeter.
Doors:	1 @ wood with wood storm door opening to enclosed front porch. 1 @ temporary plywood door insulated with 38mm glass fibre batts.
Windows:	all DG single-hung types with wood storms.
Air change:	0.99 ac/h natural, some openings in upper level envelope due to ongoing renovations.
Heating equipment:	gas conversion octopus-style convection system, assumed seasonal efficiency 0.65, interior chimney, serves 1st level mainly; two solar air collectors with forced circulation mounted on roof and serve 2nd level.
Domestic hot water:	electric.
Temp. settings:	approx. 21 C all the time; approx. winter basement temp. 17 C.
Humidity:	winter levels low to medium.
Remarks:	upgrading in progress; significant opportunity for cost effective energy conservation measures, although house small and has low total demand.

ENERGY RETROFIT

Initial Proposal:	replace all windows with TG units, incl. front porch. insulate entire front porch, replace its door to exterior. sheet exterior walls with 50mm extruded polystyrene, install vinyl siding. insulate basement to RSI 2.1 level, install vapour barrier, drywall. other: setback thermostat, ceiling fan to aid circulation on 2nd level.
Audit Findings:	seal, caulk along with other project components, weatherstrip doors. front porch, new siding, ceiling fan considered renovations. wall cavities empty, therefore reasonable to blow in loose cellulose fibre. modify window proposal to increase cost effectiveness of retrofit package. insulate basement to RSI 3.5 level.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 33m, RSI 3.5	$ 865	$1040	$1905	77500	6.7
Ext. walls, 106m^2, blown c/f	595	294	889	30400	1.8
Windows: 4 DG, 4.8m^2; 1 TG, 0.9m^2	2080	1120	3200	2600	74.1
Caulking, etc.; thermostat	213	0	213	-	-
Totals	$3753	$2454	$6207	48700	7.8

Change in estimated natural air leakage: 48 % reduction from 0.99 to 0.51 ac/h.

FILE # ED025

GENERAL DATA

Location:	Winnipeg
Vintage:	1912
Style:	1½ storey
Wall type:	wood frame, wood siding (shakes)
Basement type:	full, concrete
Floor area:	100 square metres above grade, 50 square metres in basement
Interior volume:	361 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	February 1981
Project started:	July 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	central attic: 140mm wood chips plus RSI 3.5 glass fibre batts. pitched portions: approx. 100mm wood chips between rafters. kneewall: RSI 2.1 glass fibre batts. rear attic floor: RSI 3.5 glass fibre batts.
Main walls:	main and dormer walls: sheathed both sides, cellulose fibre in approx. 100mm cavities.
Basement:	partial beamfill, 0.9m above grade, 30m perimeter uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG, mainly single-hung or fixed type with storms, except one vinyl slider in kitchen and one sealed unit (12mm spacing) in living room.
Air change:	0.79 ac/h natural, one bathroom exhaust fan.
Heating equipment:	orig. boiler converted from coal to oil to natural gas, assumed seasonal efficiency 0.55, interior chimney.
Domestic hot water:	electric.
Temp. settings:	56 h/wk @ 21 C, 112 h/wk @ 18 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low, no humidifier.
Remarks:	some water leakage into basement via cracks which must be treated prior to finishing the walls from the interior.

ENERGY RETROFIT

Initial Proposal:	weatherstrip doors, caulk and seal in basement, replace 6 windows with TG. frame and insulate basement walls and header areas to RSI 2.1 level. replace boiler with new conventional unit, add circ. pump, setback t'stat.
Audit Findings:	seal, caulk, weatherstrip entire house. insulate basement to RSI 3.5 level: contractor's method incl. RSI 2.1 batts and 38X89mm framing, with 38mm rigid extruded polystyrene next to wall. 1 of the 6 windows is newer sealed DG unit, 1 other is vinyl slider which could be upgraded with interior 3rd pane, 2 others to be replaced with one combination unit: total approx. 3 square metres, 3 new TG, 1 interior 3rd pane. payback on boiler efficiency increase to approx. 0.70 (as proposed) is approx. same (11 years) as on upgrading to high-efficiency pulse type. combustion/dilution air duct suggested if airtightness increases greatly.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal cracks, caulk, weatherstrip	$ 422	$ 0	$ 422	6300	4.1
Windows: 3 TG, 1 3rd pane	1109	626	1735	1700	61.2
Basement walls, 30m, RSI 3.5	1085	560	1645	17700	5.7
Boiler, duct, pump, thermostat	-	-	2800	13700	12.5
Totals	-	-	$6602	35000	11.6

Change in estimated natural air leakage: -1 % reduction from 0.79 to 0.80 ac/h (new combustion air duct).

FILE # ED047

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1945
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	110 square metres above grade, 68 square metres in basement
Interior volume:	451 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	4
Occupancy:	September 1981
Project started:	June 1983
Project completed:	August 1984

PRE-PROJECT HOUSE

Ceilings:	central attic: assumed loosefill cellulose to approx. RSI 4.4. pitched portions: RSI 1.2 or RSI 2.1 glass fibre batts between rafters. side attics: glass fibre batts: RSI 3.5 on kneewalls and horizontal between joists, RSI 2.1 on sloped ceilings.
Main walls:	25mm drywall on interior side, shiplap sheathing on exterior side, mixture of wood shavings and cellulose in 89mm cavities.
Basement:	partial beamfill, 0.7m above grade, 35m perimeter uninsulated.
Doors:	2 @ single wood doors.
Windows:	1 basement and 1 bedroom window SG fixed units, remainder DG some sealed units (13-17mm spacings) and one DG vertical slider.
Air change:	0.52 ac/h natural, kitchen exhaust fan.
Heating equipment:	boiler more than 40 years old, assumed seasonal efficiency 0.60, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 C all the time; winter basement temp. approx. 18 C.
Humidity:	winter levels low, no humidifier.
Remarks:	evidence of previous upgrading of windows and attics under former occupancy.

ENERGY RETROFIT

Initial Proposal:	replace all "old" windows with TG, incl. change locations of some. replace and relocate front door with steel, insulated type. insulate basement to RSI 2.1 level and upgrade attic areas by RSI 3.5. install pre-purchased new boiler and insulated chimney, convert old boiler to burn coal or wood as a supplemental heater. double-wall retrofit, incl. RSI 4.9 in glass fibre batts, 38X64mm curtain wall, cedar siding, by skilled homeowner.
Audit Findings:	with homeowner supplying most of labour component, this project has an attractive expected payback through saved energy, less than 10 years. cost estimates in the proposal are somewhat rough, need to be firmed up. air leakage sealing is required in many locations, should be incorporated within the project.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
11 windows and 1 door	-	-	-	3000	-
Basement	-	-	-	14500	-
Attic	-	-	-	1100	-
Double-wall retrofit	-	-	-	27600	-
Boiler connection, etc.	-	-	-	5600	-
Totals	-	-	$7005	51600	8.3
Change in estimated natural air leakage: -18 % reduction from 0.52 to 0.61 ac/h.					

FILE # ED048

GENERAL DATA

Location:	Duck River
Vintage:	1915 (est.)
Style:	1½ storey
Wall type:	solid wood, wood siding
Basement type:	full, concrete
Floor area:	153 square metres above grade, 66 square metres in basement
Interior volume:	570 cubic metres
Heating system:	wood, convection
Occupants:	2
Occupancy:	May 1976
Project started:	September 1983
Project completed:	December 1984

PRE-PROJECT HOUSE

Ceilings:	uninsulated; upper level (62 square metres) is unheated.
Main walls:	100X100mm planks stacked horizontally, 40mm clay/straw/manure exterior coat then 25mm lapped boards as sheathing, clay on lath interior.
Basement:	partial beamfill, 1.8m above grade, 33m perimeter uninsulated incl. headers.
Doors:	3 @ wood doors, two with wood storm doors one of which is insulated with RSI 3.5 glass fibre batts.
Windows:	6 TG combination sealed units above sliders, 12 DG single-hung type with wood storms, 2 SG single-hung type without storms, 4 SG fixed units.
Air change:	0.70 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	main floor wood stove, interior chimney.
Domestic hot water:	no hot water heater.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. very low due to extent to which basement walls are exposed above grade.
Humidity:	winter levels low except when water on stove; basement damp; no dryer.
Remarks:	no footings, some settlement evident; homeowner has marauding chickens.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip doors and windows.
replace main floor and 2 attic level windows with TG units.
replace front door with steel, insulated type.
remove main floor siding, apply 100mm rigid extruded polystyrene and reside.
insulate attic with RSI 3.5 batts and 50mm rigid extruded polystyrene board.
apply 75mm rigid extruded polystyrene on bas't exterior to 0.6m below grade.
install floor registers and fans to aid convection of heat to attic.
install combustion air duct.

Audit Findings: suggested double-wall retrofit instead of proposal: homeowner enthusiastic.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal, caulk, weatherstrip	-	-	-	4000	-
TG windows, 8m^2	-	-	-	7400	-
2 steel, insulated doors	-	-	-	1200	-
Double wall, 34m perim., RSI 4.9	-	-	-	22000	-
Basement walls, 34m, RSI 2.6	-	-	-	23300	-
Attic upgrade, approx. RSI 3.5	-	-	-	25600	-
Miscellaneous duct, fans, etc.	-	-	-	-	-
Totals	-	-	$10862	77100	5.1

Change in estimated natural air leakage: 70 % reduction from 0.70 to 0.21 ac/h.

FILE # ED057

GENERAL DATA

Location:	Vogar
Vintage:	1910
Style:	1½ storey
Wall type:	concrete block, strapped on interior
Basement type:	full, concrete block
Floor area:	108 square metres above grade, 108 square metres in basement
Interior volume:	563 cubic metres
Heating system:	wood and electric, convection
Occupants:	4
Occupancy:	June 1973
Project started:	October 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	upper half storey unheated; a drop ceiling below the upper floor joists insulated with RSI 1.4 glass fibre batts.
Main walls:	46m perimeter of 273mm concrete blocks: 26m strapped on interior with 38X38mm framing and insulated with RSI 1.4 glass fibre batts, 5m with exterior 50mm rigid extruded polystyrene board and cedar siding, 15m strapped on interior with 38X89mm framing and insulated with RSI 2.1 glass fibre batts.
Basement:	1.1m above grade, header areas uninsulated. 45m perimeter: 3m with 38X89mm framing spaced out from wall and 2 layers of RSI 2.1 glass fibre batts, 42m with uncovered 25mm rigid expanded polystyrene board full height.
Doors:	3 @ wood doors without storm doors.
Windows:	DG: 4 sealed units (12mm spacing), 8 basement fixed units with storms. TG: 2 sealed units (5mm spacings), 7 casements (9mm spacings).
Air change:	0.69 ac/h natural, kitchen exhaust fan vented into attic, no fresh air or combustion air ducts.
Heating equipment:	wood stove in basement, electric baseboard heater on main floor, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 15 C, 56 h/wk @ 20 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low to medium, minimal window condensation and electrical outlet frosting, dryer vented indoors to basement.
Remarks:	upper storey sealed off because difficult to heat entire house (windy site).

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip basement, bedrooms, porch. replace 1 DG window with TG unit, front door with metal, insulated type. apply 50mm rigid foil-faced isocyanurate board to interior wall surfaces in living room and bedrooms, and to exterior of porch, cover with gypsum board or siding as appropriate. frame, panel, and insulate basement walls to additional RSI 4.2 level. add 300mm loosefill cellulose fibre to dropped ceiling area. construct and install insulated shutters for most main floor windows.
Audit Findings:	homeowner plans to leave an air space between drywall and insulation on the interior to take advantage of the reflective property of the foil face. ceiling area should be vented to attic through upper floor system, attic should be vented to exterior, ceiling penetrations should be sealed. shutter construction should emphasize airtightness to stop window frosting and should avoid risk of fire if rigid insulation materials to be used.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip; door; shutters; main walls, 26m; basement walls, 42m; attic, 108m^2; combustion air duct; basement fan	-	-	$8000	21700	13.3
Change in estimated natural air leakage: 39 % reduction from 0.69 to 0.43 ac/h.					

FILE # ED061

GENERAL DATA

Location:	Winnipeg
Vintage:	1922
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	168 square metres above grade, 82 square metres in basement
Interior volume:	574 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	July 1981
Project started:	July 1983
Project completed:	December 1983

PRE-PROJECT HOUSE

Ceilings:	central and side attics: approx. 125mm wood shavings between joists. pitched portions: approx. 75mm wood shavings.
Main walls:	shiplap sheathing both sides, approx. 100mm cavities filled with wood shavings with minor settlement.
Basement:	partial beamfill, 0.75m above grade, 37m perimeter uninsulated.
Doors:	1 @ wood with wood storm door. 1 @ wood with aluminum storm door.
Windows:	all DG single-hung and fixed types with wood storms.
Air change:	0.48 ac/h natural, one passive vent, no fresh air intake to return air duct.
Heating equipment:	very large conventional gas furnace, approx. 20 years old, assumed seasonal efficiency 0.6, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 16 C.
Humidity:	low winter levels, humidifier used, dryer vented indoors.
Remarks:	a classic 1½ storey with high bas't heat loss and oversized heating system.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. insulate empty exterior wall cavities, pitched roof portions, dormers with expanded polystyrene beads. frame and insulate basement walls with RSI 3.5 glass fibre batts. seal all penetrations, insulate main attic with loosefill cellulose fibre to RSI 7.0, add static and wind-powered vents.
Audit Findings:	walls filled with wood shavings, inappropriate to reinsulate. kneewall attics are finished, heated, and used as storage closets: suitable for application of 50mm rigid extruded polystyrene to pitched ceilings. air seal, basement, attic proposals appropriate, except too much venting. installation of condensing-type high efficiency furnace (approx. 0.90) suggested because of age, low efficiency of existing oversized furnace. fresh air intake to return air duct to be installed.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 336	$ 336	$ 672	6428	6.4
Basement walls, 37m, RSI 3.5	843	630	1473	17300	5.2
Main ceiling, 54m^2, blown c/f	270	114	384	4700	5.0
Pitched ceil., 29m^2, rigid ins.	401	279	680	2400	17.1
Pulse-type furnace, duct	2370	525	2895	25600	6.9
Totals	$4220	$1884	$6104	41800	9.0

Change in estimated natural air leakage: unknown % reduction: final value 0.65 ac/h (initial and final tests subject to error because of unusual high winds in opposite directions).

FILE # ED103

GENERAL DATA

Location:	Winnipeg
Vintage:	1920
Style:	1½ storey
Wall type:	wood frame, mixture of wood siding, stucco, and brick
Basement type:	full, concrete
Floor area:	134 square metres above grade, 85 square metres in basement
Interior volume:	537 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	5
Occupancy:	September 1971
Project started:	March 1984
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	central portion: approx. 75mm wood shavings and vermiculite. pitched portions: approx. 100mm rafter spaces full of wood wool or similar. west side attics: kneewalls with wood wool or similar between studs and wood shavings to top of attic floor joists. east side attic: used for closet, etc. with same kneewall and floor treatment plus RSI 1.4 glass fibre batts on knees and minor additional vermiculite on floors; also wood wool or similar between rafters.
Main walls:	shiplap sheathing both sides with approx. 100mm wood shavings in cavities.
Basement:	full beamfill, 0.9m above grade, header uninsulated. 39m perimeter: 33m with 38X64mm framing and RSI 1.4 glass fibre batts except for bottom 0.6m, remaining 6m uninsulated.
Doors:	1 @ wood with wood storm door, 1 @ wood with aluminum storm door.
Windows:	all DG orig. single-hung or fixed types with wood or aluminum storms, one DG sealed unit (12mm spacing).
Air change:	0.60 ac/h natural, no exhaust fans.
Heating equipment:	original coal-fired boiler converted to natural gas, assumed seasonal efficiency 0.5, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low, dryer vented outdoors, pans of water set on radiators.
Remarks:	energy conservation potential in upper part of envelope and heating system.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house, replace doors with insulated type. insulate walls with cellulose fibre, upgrade insulation in west side attic. insulate bottom 0.6m of basement walls with glass fibre batts. replace boiler with pulse-type with add-on DHW heater.
Audit Findings:	walls already insulated with wood shavings, not worth topping up. basement difficult to do (damage panelling), but upgrading and sealing of entire attic area is a priority: contractor proposes to add RSI 5.6 on horizontals, RSI 3.5 batts on kneewalls (fair amount of insulation already present but air sealing most critical). significant saving to be expected from boiler replacement (assumed seasonal efficiency 0.90), but not DHW work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 350	$ 340	$ 690	9100	4.7
Attic insulation as above	536	431	967	5500	10.8
Pulse-type boiler	3633	983	4616	32900	8.6
Totals	4519	1754	6273	39400	9.8

Change in estimated natural air leakage: 8 % reduction from 0.60 to 0.55 ac/h.

FILE # ED199

GENERAL DATA

Location:	Ste. Rose du Lac
Vintage:	1935 (est.)
Style:	1¼ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	155 square metres above grade, 92 square metres in basement
Interior volume:	432 cubic metres
Heating system:	oil, forced air
Occupants:	4
Occupancy:	unknown
Project started:	August 1983
Project completed:	August 1984

PRE-PROJECT HOUSE

Ceilings:	central and side attics: 200mm loosefill cellulose fibre; 2 vents at peak. pitched and kneewall portions: uninsulated.
Main walls:	shiplap both sides, 38X89mm framing: one 10m wall filled with wood shavings, remaining 29m uninsulated.
Basement:	partial beamfill, 0.8m above grade, 38m perimeter uninsulated full height.
Doors:	3 @ single wood doors, 2 of which open to enclosed porches.
Windows:	all DG single-hung with wood storms except 3 missing their storms.
Air change:	0.54 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace approx. 18 years old, assumed seasonal efficiency 0.65, interior chimney; supplementary heat from wood stove in kitchen.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 10 C.
Humidity:	winter levels low, portable humidifiers used, dryer vented indoors.
Remarks:	uninsulated walls make this house expensive to heat.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip on main and upper levels.
replace 3 upper level windows with TG sealed/casement combination units.
replace 3 doors with 2 steel, insulated types and 1 wood type to basement.
blow cellulose fibre into empty wall cavities.
insulate basement walls with 38mm extruded polystyrene board and 38X64mm framing with RSI 2.1 glass fibre batts, vapour barrier and drywall.
insulate pitched and kneewall portions of attic with cellulose fibre.
replace oil furnace with wood/electric furnace, install kitchen ceiling fan and setback thermostat.
replace copper uninsulated DHW tank with insulated type and insulate water lines.

Audit Findings:
ceiling fan, door and window replacement considered renovation work.
careful air sealing effort is important in all areas of house to protect insulation and structure from potentially increased moisture levels.
basement insulation easiest to do with good air seal on exterior of house; if done on interior, RSI 3.5 is appropriate (homeowner preferred this).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 319	$ 434	$ 753	4400	5.7
Insulate main walls, 2.7X29m	540	420	960	12200	2.6
Basement walls, 38m, RSI 3.5	1340	686	2026	15900	4.2
Attic upgrade as above	1672	949	2621	12400	6.9
Wood/electric furnace, service	3252	605	3857	26500	4.1
Totals	$7123	$3094	$10217	52800	6.1

Change in estimated natural air leakage: 53 % reduction from 0.54 to 0.25 ac/h.

FILE # ED228

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	1½ storey
Wall type:	interior brick with exterior wood framing, stucco
Basement type:	full, concrete
Floor area:	99 square metres above grade, 46 square metres in basement
Interior volume:	325 cubic metres
Heating system:	oil, forced air; supplementary electric space heaters
Occupants:	1
Occupancy:	January 1983
Project started:	December 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	main attic: 50mm wood shavings plus RSI 3.52 glass fibre batts. pitched portions and kneewalls: approx. 89mm wood shavings between framing.
Main walls:	lath and plast., 100mm brick, shiplap, empty 89mm cavities, shiplap, stucco.
Basement:	partial beamfill, 0.6m above grade, 30m perimeter uninsulated.
Doors:	1 @ 32mm wood door which opens to enclosed porch. 1 @ 32mm wood door with storm door.
Windows:	mostly DG single-hung types with aluminum storms, 2 SG without storms.
Air change:	0.87 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace, 30-40 years old, assumed seasonal efficiency 0.60, interior chimney; 4 supplementary electric resistance heaters in use.
Domestic hot water:	electric.
Temp. settings:	20 C all the time; winter basement temp. approx. 15 C.
Humidity:	winter levels low, no humidifier, dryer vented outdoors.
Remarks:	unsafe homeowner-implemented modification to combustion/dilution air system.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by contractor.
insulate walls, pitched portions, dormers with expanded polystyrene beads.
insulate basement perimeter walls from interior to RSI 3.5 level.
seal and insulate attic with blown cellulose to RSI 7.0 level.
insulate floor of enclosed porch (crawl space), RSI 3.5 glass fibre batts.
replace oil furnace with natural gas, condensing type or electric furnace.

Audit Findings:
proposed components of project are cost effective; pitched portions full.
upgraded house would have low enough demand that electrical service would not need to be upgraded from existing 100 amps for 10kW electric furnace or duct heater; fresh air intake to return air duct suggested for either electric or natural gas conversions when accompanied by other retrofit components.
less costly wall insulation may be possible with materials other than beads.
porch floor component dropped from proposal as already completed.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 235	$ 353	$ 588	6900	2.8
Wall insulation, 100m^2, beads	1500	944	2444	22400	3.6
Basement insul., 30m, RSI 3.5	686	1029	1715	16600	3.4
Attic, 25m^2, add RSI 2.4 c/f.	285	225	510	4400	3.8
20 kW elec. furnace, 200 amp. serv.	-	-	2424	32700	2.1
Totals	-	-	$7681	62700	3.9

Change in estimated natural air leakage: 31 % reduction from 0.87 to 0.60 ac/h.

FILE # ED234

GENERAL DATA

Location:	Carman
Vintage:	1944
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	136 square metres above grade, 83 square metres in basement
Interior volume:	515 cubic metres
Heating system:	coal, gravity air
Occupants:	3
Occupancy:	possibly original
Project started:	February 1984
Project completed:	May 1984

PRE-PROJECT HOUSE

Ceilings:	main attic, pitched portions, and kneewalls: RSI 2.1 glass fibre batts. side attic floors: RSI 3.5 glass fibre batts.
Main walls:	shiplap both sides, 38X89mm framing, 50mm rockwool batts, lath and plaster.
Basement:	full beamfill, 0.6m above grade. 37m perimeter uninsulated full height (9m^2 open cistern in one corner).
Doors:	2 @ wood with wood storm doors.
Windows:	2 new TG vinyl sliders, 3 new TG casements, remainder DG single-hung types with wood storms, except storms missing on basement windows.
Air change:	construction in progress prevented test, no exhaust fan or fresh air intake.
Heating equipment:	orig. coal furnace with stoker mechanism, assumed seasonal efficiency 0.55, interior chimney; supplementary heat from fireplace with ext. chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 10-15 C.
Humidity:	moderate winter levels, no condensation on windows, dryer vented outdoors, cistern provides some humidification.
Remarks:	local coal supply now uncertain ; fine coal dust evident on interior surfaces, esp. where condensation has occurred along studs and rafters.

ENERGY RETROFIT

Initial Proposal:	caulk and seal windows and doors; replace 2 storm doors. apply 38mm rigid insulation to ext. of main walls, finish with new siding. insulate exterior of basement walls with 50mm rigid extruded polystyrene board down 1.2m and 0.6m horizontally. add 100mm blown-in loosefill glass fibre to attic horizontal portions. * convert to electric baseboard heating system (saves energy but not cost *).
Audit Findings:	extensive air sealing effort is suggested for most portions of envelope. suggested to add RSI 3.5 or more to attic where feasible. exterior wall reinsulation not cost effective even though siding needs refinishing: other exterior options explained. exterior basement insulation best method due to difficulty of interior work; appropriate to go to 0.3m below grade, then 1.2m horizontally. storm door replacement would be considered as renovation work. central exhaust system suggested for humidity control which may be required with new electric heating system.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal, caulk, weatherstrip	$ 125	$ 0	$ 125	4400	3.4
Exterior bas't walls, 37m, RSI 1.8	1252	0	1252	13800	11.0
Attic upgrade as above (cellulose)	129	0	129	1700	9.1
Elec. heat, service, central exhaust	-	-	2848	27200	n/a (see * above)
Totals	-	-	$4354	37500	n/a (see * above)

Change in estimated natural air leakage: unknown reduction to 0.22 ac/h.

FILE # ED248

GENERAL DATA

Location:	Brandon
Vintage:	1920-30 (est.)
Style:	1½ storey
Wall type:	concrete tile, stucco
Basement type:	full, concrete (crawl space under old front porch area, now living space)
Floor area:	122 square metres above grade, 75 square metres in basement
Interior volume:	479 cubic metres
Heating system:	natural gas, forced air
Occupants:	3 (4th expected)
Occupancy:	early 1983
Project started:	August 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	pitched and kneewall portions: panelling and RSI 1.4 batts; no attic vents. 1st floor ceiling incl. side attics: joist spaces filled with wood shavings. upper level attic: small area assumed to be same as side attics.
Main walls:	stucco on exterior, concrete tiles, lath and plaster: 250mm thick wall.
Basement:	full beamfill (conc. tiles, joists, and headers on top of conc. wall), 0.8m above grade, 39m perim. uninsul., incl. 7m of 1.3m high crawl space.
Doors:	1 @ wood with aluminum storm door, 1 @ wood opening to enclosed porch.
Windows:	all DG, mostly single-hung type with wood storms, some fixed wood with storms, one wood casement with storm.
Air change:	0.38 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 22 C; winter basement temp. approx. 16 C.
Humidity:	winter levels likely medium, basement damp, humidifier usage unknown.
Remarks:	temp. must be maintained at 22 C for acceptable comfort; uninsulated walls cool, although homeowners have only spent the late winter in the house.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace old wooden fixed storms with new movable types. blow cellulose fibre into empty wall cavities. frame, drywall, and insulate basement walls to RSI 3.5 level.
Audit Findings:	window alterations considered to be renovation work. main walls are masonry, therefore there are no cavities to insulate. moisture causing crumbling of basement wall surface: moisture barrier is necessary before finishing basement. suggested to convert to high-efficiency (approx. 0.90) natural gas furnace because it is impractical to insulate main walls at this time: homeowner preferred condensing pulse-type, setback thermostat, fresh air intake to return air duct. upper level could be upgraded to become higher-quality living space, but homeowners have limited funds and do not need the space immediately. homeowners subsequently decided to finish upper level, incl. adding dormer.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 275	$ 275	$ 550	3900	9.6
Basement walls, 39m, RSI 3.5	1145	1000	2145	16700	8.9
Furnace as above, t'stat, duct	961	1807	2768	21500	8.9
Totals	$2381	$3082	$5463	35300	10.7
Change in estimated natural air leakage: 23 % reduction from 0.38 to 0.30 ac/h (fresh air intake installed).					

FILE # ED041

GENERAL DATA

Location:	Winnipeg
Vintage:	1950-55 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	99 square metres above grade, 64 square metres in basement
Interior volume:	371 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	August 1978
Project started:	June 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	central, dormer ceilings, pitched portions: approx. RSI 1.2 batts, all areas recently refinished with drywall. kneewalls: RSI 1.2 batts between studs, plus RSI 3.5 glass fibre batts. side attics: on horizontal, RSI 1.2 batts and wood shavings to joist tops plus RSI 3.5 glass fibre batts over top.
Main walls:	RSI 1.2 batts in 89mm cavities.
Basement:	full beamfill, 0.6m above grade, 32m perimeter framed, insulated, drywalled, using glass fibre batts to RSI 3.5 (late 1982).
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG vertical and horizontal aluminum sliders, except DG sealed picture window (12mm spacing) in living room.
Air change:	0.33 ac/h natural.
Heating equipment:	conventional gas furnace approx. 20 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 40 h/wk @ 20 C, 128 h/wk @ 15-20 C (varies); winter basement temp. can be considered to be the same since basement insulated.
Humidity:	winter levels medium, dryer vented outdoors.
Remarks:	major renovation, energy conservation included, is planned.

ENERGY RETROFIT

Initial Proposal:	main level to be gutted and entire interior to be rebuilt, windows and doors to be replaced with contemporary TG units and steel, insulated type, walls to be furred out on interior and insulated with RSI 3.5 glass fibre, exterior to be sheathed with 50mm rigid extruded polystyrene and restuccoed, additional attic ventilation to be installed. replace furnace with condensing, high-efficiency type (approx. 0.90), add fresh air intake, modify ductwork to upper levels.
Audit Findings:	some of proposed work must be considered to be renovation rather than energy conservation work, but costs are intertwined: expected simple payback period for work, based on energy savings alone, is more than 20 years; existing stucco in need of repair. some air leakage sealing in other specific areas is suggested. dining room window to have 3rd pane installed, patio door to be funded as renovation measure by homeowner.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Windows: 3 TG, 1 3rd pane	$1122	$ 0	$1122	1800	37.4
Main wall retrofit, 94m^2	3060	597	3657	7100	31.6
Condensing furnace, ductwork	1865	1210	3075	8700	21.6
Totals	$6047	$1806	$7853	15300	31.4

Change in estimated natural air leakage: -11 % reduction from 0.33 to 0.37 ac/h.

FILE # ED045

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	1½ storey with rear main floor addition
Wall type:	wood frame, wood siding
Basement type:	no basement, house on grade beam, rear addition on posts and pads
Floor area:	98 square metres above grade
Interior volume:	244 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	March 1981
Project started:	June 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	rear addition: RSI 2.1 or RSI 1.4 glass fibre batts, depending on location. central attic, west side attic floor: RSI 6.2 mainly loosefill glass fibre. pitched portions: approx. RSI 1.2 batts. east side storage attic: sloped ceiling and end walls approx. RSI 1.2 batts or 38mm rigid expanded polystyrene.. west side attic: kneewall uninsulated.
Main walls:	89mm cavities with approx. RSI 1.2 batts, shiplap sheathing, drywall. rear addition: RSI 2.1 or RSI 1.4 glass fibre batts, depending on location.
Basement:	0.6m above grade, headers and floor joists on sill on concrete perimeter beam/footing, uninsulated.
Doors:	2 @ steel, insulated doors.
Windows:	all DG single-hung type with mostly aluminum storms.
Air change:	1.13 ac/h natural, no exhaust fans, upper level envelope leaky.
Heating equipment:	conventional gas furnace approx. 15 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 C all the time.
Humidity:	winter levels low due to high air leakage.
Remarks:	crawl space and airtightness are priorities for heat loss reduction.

ENERGY RETROFIT

Initial Proposal:	close off 6 windows, reduce 2 in size, add 2 new TG units in new dormers. strip old siding and inspect sheathing, then sheet with 50mm rigid extruded polystyrene and install vinyl siding. sheet and side exterior of crawl space to grade, same materials as above. refinish upper level interior with 50mm extruded polystyrene, drywall. minor electrical renovations, additional caulking in other areas of house.
Audit Findings:	upper level partially insulated, but poor airtightness suggests rebuilding would be the appropriate approach; dormers considered renovation work. expected simple payback periods for single-wall retrofit and window work are greater than 20 years but overall cost effectiveness improved due to ceiling and crawl space components of project.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Windows: seal off 4, replace 4	$1092	$ 600	$1692	1500	70.8
Single-wall, crawl space retrofit	3750	2046	5796	15100	23.5
Rebuild, refinish upper level	1300	1210	2510	13900	11.1
Totals	$6142	$3856	$9998	28700	21.4
Change in estimated natural air leakage: 56 % reduction from 1.13 to 0.49 ac/h.					

FILE # ED050

GENERAL DATA

Location:	Winnipeg
Vintage:	1946
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	111 square metres above grade, 63 square metres in basement
Interior volume:	402 cubic metres
Heating system:	natural gas, forced air
Occupants:	1
Occupancy:	October 1982
Project started:	July 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	main and dormer ceilings: 100mm wood shavings covered with 75mm vermiculite. side attics: 100mm wood shavings, no ventilation to outdoors. kneewalls: RSI 1.2 batts, no ventilation.
Main walls:	89mm wall cavities with RSI 1.2 batts.
Basement:	full beamfill, 0.75m above grade, 33m perimeter uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung type with wood storms, except thoroughfare-facing living room and bedroom windows which are DG sealed units (narrow spacing).
Air change:	0.24 ac/h natural, no exhaust fans, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace approx. 20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	assumed 20 C all the time; winter basement temp. approx. 16 C.
Humidity:	winter levels low to medium, no humidifier, nat. gas dryer vented outside.
Remarks:	house recently acquired from original owner and is in excellent condition with upper level recently redecorated.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. insulate basement walls from interior using 38X89mm framing, RSI 3.5 glass fibre batts. upgrade horizontal attic and pitched roof insulation to RSI 7.0 level with blown loosefill glass fibre, add RSI 3.5 glass fibre batts to kneewalls, install ventilation in side attics.
Audit Findings:	this is a basic retrofit proposal for energy conservation upgrading of a house of this type and age, and is very cost effective with total expected energy saving of almost 40 %. only selected air sealing required because house already quite tight. additional suggested measures: 3rd storm panes for 2 sealed picture windows, with noise reduction as a side benefit, boost RSI value of pitched ceilings by adding rigid extruded polystyrene and drywall to interior (rafter spaces already filled with wood shavings); in this case, this would involve damage to recent textured finish: not acceptable.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Weatherstripping, plug gaskets	$ 62	$ 0	$ 62	-	-
Third pane to 3.6m^2 glass area	177	60	237	1100	13.6
Basement walls, 33m, RSI 3.5	819	814	1633	15900	6.3
Attic, kneewalls, vents as above	413	357	770	4400	10.8
Totals	$1470	$1231	$2701	21300	7.8

Change in estimated natural air leakage: -71 % reduction from 0.24 to 0.41 ac/h.

FILE # ED094

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	123 square metres above grade, 74 square metres in basement
Interior volume:	481 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1976
Project started:	August 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	central and side attic floors: 100mm wood shavings and blown loosefill cellulose fibre to RSI 7.0. pitched portions: 89mm rafter spaces filled with wood shavings. kneewalls: approx. RSI 1.2 mineral wool batts.
Main walls:	125 square metres with RSI 1.2 batts and UFFI.
Basement:	full beamfill, 0.75m above grade, header uninsulated. 35m perimeter: 7m with 38X38mm furring and panelling, 28m uninsulated. 31 square metre area in one corner with plywood subfloor on sleepers.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung type with wood storms, except DG sealed unit in living room, and combination DG aluminum bottom slider/TG sealed picture window in dining room.
Air change:	0.41 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil), greater than 20 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 22 C, 56 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, frost on windows, no humidifier, dryer vented outside.
Remarks:	house has had partial air leakage sealing during contractor staff training programme; basement walls have significant cracks and water leakage; occupants having no trouble with UFFI and do not plan to remove it.

ENERGY RETROFIT

Initial Proposal:	complete previously unfinished seal, caulk, weatherstrip by contractor. insulate basement walls from interior with 38X89mm framing, RSI 3.5 glass fibre batts, drywall. replace furnace with condensing, pulse-type unit with setback thermostat (approx. 0.90), electronic air cleaner.
Audit Findings:	must attend to cracks in basement concrete wall before insulating. electronic air cleaner not an energy-conserving measure. project has expected simple payback period of approx. 13 years with approx. 40% saving in total energy consumption.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 304	$ 454	$ 758	4000	11.7
Basement walls, 35m, RSI 3.5	1087	1087	2174	12100	11.0
Furnace replacement, minor ductwork	2573	583	3156	14510	13.3
Totals	$3964	$2124	$6088	26110	14.3
Change in estimated natural air leakage: 11 % reduction from 0.41 to 0.37 ac/h.					

FILE # ED126

GENERAL DATA

Location:	Winnipeg
Vintage:	1955 (est.)
Style:	1½ storey
Wall type:	wood frame, 76% stucco, 24% wood siding
Basement type:	full, concrete
Floor area:	111 square metres above grade, 74 square metres in basement
Interior volume:	442 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	July 1981
Project started:	July 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	inaccessible due to previous upgrading/refinishing: assumed RSI 3.5.
Main walls:	89mm cavities with RSI 1.2 batts, double layer of drywall.
Basement:	full beamfill, 0.6m above grade. 35m perimeter: 18m framed, insulated from subfloor to floor slab, panelled to approx. RSI 0.9, 17m uninsulated
Doors:	2 @ wood with aluminum storm doors.
Windows:	mostly DG single-hung type with wood storms, except sealed units facing street, one DG and one TG (12mm spacings).
Air change:	0.37 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil furnace), assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 17.5 C all the time; winter basement temp. approx. 15.5 C.
Humidity:	winter levels low, room-size humidifier used, dryer vented inside/outside.
Remarks:	approx. 25mm thick product of efflorescence found in places on basement wall behind old panelled section.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace dining room and main level bedroom windows with TG units. insulate/reinsulate basement walls from interior to RSI 3.5 level. replace furnace with energy-efficient type (spark ignit., vent damper, 0.75) along with ductwork and chimney liner.
Audit Findings:	insulation status of attic areas should be ascertained and, if applicable, sealed and brought up to horizontal/vertical levels of RSI 7.0/3.5. air seal, basement, furnace package would result in total home energy saving greater than 30%: if attic upgrading is required, 40% level could be attained with expected simple payback period of 10-12 years.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 369	$ 337	$ 706	3700	11.8
Basement walls, 35m, RSI 3.5	761	1077	1838	8000	14.0
Attic upgrade as above	582	313	895	4700	11.6
Energy-efficient furnace	-	-	1385	5400	15.6
Totals	-	-	$4823	19600	15.1
Change in estimated natural air leakage: 3 % reduction from 0.37 to 0.36 ac/h.					

FILE # ED200

GENERAL DATA

Location:	Sanford
Vintage:	1950 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	167 square metres above grade, 98 square metres in basement
Interior volume:	601 cubic metres
Heating system:	oil, forced air
Occupants:	4
Occupancy:	August 1982
Project started:	November 1983
Project completed:	June 1984

PRE-PROJECT HOUSE

Ceilings:	upper, south main attics: wood shavings, loosefill glass fibre to RSI 7.0. pitched portions, side attic storage: wood shavings in rafter spaces. south kneewalls: 89mm wood shavings.
Main walls:	shiplap sheathing on exterior, 38X89mm framing with wood shavings.
Basement:	full beamfill, 0.6m above grade. 44m perimeter: approx. 29m panelled with 38X89mm framing and RSI 2.1 glass fibre batts incl. header areas, 15m uninsulated (4m has brick finish).
Doors:	3 @ wood, 2 of which have aluminum storm doors.
Windows:	mixture of DG wood windows of fixed, casement, and slider types, 2 TG combination fixed/slider units, and 1 glass block sidelite.
Air change:	0.57 ac/h natural, kit. exhaust fan, no fresh air intake to return air duct.
Heating equipment:	newer oil furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary insert-type wood fireplace in living room is used extensively (4-5 half ton truckloads per winter), exterior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk turned off; winter basement temp. approx. 15.5 C.
Humidity:	winter levels low, portable humidifier used, no window condensation.
Remarks:	main floor construction: joists, 19mm shiplap, 75mm concrete, possible plywood under carpet or linoleum finish.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by homeowner. replace 6 windows (incl. 2 bay windows) with TG units. add interior magnetic-type 3rd panes to 2 windows. replace 3 doors with insulated, steel type. frame, drywall, and insulate remaining portion of basement wall to RSI 3.5. convert to electric furnace, modify some ductwork. misc.: fluorescent lighting, dimmers, ceiling fan, insulate DHW lines.
Audit Findings:	minor components of completed project: 2 upper storey windows, close off one entry, upgrade kneewall areas, misc. parging and stucco. basement wall project: 11m interior surface to RSI 3.5, 44m exterior surface with 50mm extruded polystyrene to below grade and 1.0m horizontal. house quite leaky to air: major air sealing effort advisable.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 484	$ 584	$1068	6300	5.5
Basement walls, as above	947	495	1442	10600	4.4
20 kW electric furnace, ductwork	1667	1258	2925	22400	3.5
Minor components as above	404	240	644	-	-
Totals	$3501	$2577	$6078	31600	5.6
Change in estimated natural air leakage: 12 % reduction from 0.57 to 0.50 ac/h.					

FILE # ED204

GENERAL DATA

Location:	Winnipeg
Vintage:	1946
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	83 square metres above grade, 53 square metres in basement
Interior volume:	329 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	1946
Project started:	August 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	central attic, pitched portions, kneewalls: 89mm wood shavings between framing members; side attics not vented to outdoors. side attic floors: 125-150mm wood shavings between joists.
Main walls:	38X89mm framing with wood shavings, shiplap exterior sheathing, 2 coats of stucco (recent upgrade).
Basement:	full beamfill, 0.75m above grade, 31m perimeter uninsulated.
Doors:	2 @ wood, one with wood storm door, the other with aluminum storm door. 2 @ wood with thin backing of insulation, opening to the side attics.
Windows:	DG basement and bathroom single-hung or fixed type with wood storms; all remaining have been upgraded in the past to DG vertical or horizontal aluminum sliders, except DG vinyl slider in main floor front bedroom and DG sealed unit (12mm spacing) in living room.
Air change:	0.39 ac/h natural, no exhaust fans.
Heating equipment:	gas boiler conversion from orig. boiler, assumed seasonal efficiency 0.55, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 22 C, 56 h/wk @ 20 C; winter basement temp. approx. 18 C; upper level is separated from main level by a closed door at the bottom of the stairway and is kept at significantly lower temp. most of the time.
Humidity:	winter levels medium, no humidifier, dryer vented outdoors; upper level windows frost up, likely due to lower temperature settings.
Remarks:	original occupants, house in excellent condition.

ENERGY RETROFIT

Initial Proposal:	renew weatherstripping on doors, caulk upper-level and basement windows. replace one bathroom window and one basement window. insulate basement walls from interior to RSI 2.1 level. upgrade attic insulation: RSI 7.0/3.5 on horiz./vert. (add RSI 5.6/2.1). replace boiler with energy-efficient type with circ. pump (approx. 0.80).
Audit Findings:	reasonable to seal, caulk, weatherstrip entire house. part of one side attic used as storage area for non essential items, floor should be left clear of insulation for same (4 or 5 square metres). window replacement dropped, basement insulation proposal raised to RSI 3.5. combustion/fresh air duct suggested for vicinity of boiler.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 222	$ 178	$ 400	3200	7.7
Attic as above with vents	400	435	835	7300	7.0
Basement walls, 31m, RSI 3.5	1011	690	1701	15900	6.6
Energy-efficient boiler, duct	3340	526	3866	16700	14.2
Totals	$4973	$1829	$6802	33500	12.5

Change in estimated natural air leakage: 21 % reduction from 0.39 to 0.31 ac/h (new combustion air duct installed).

FILE # ED213

GENERAL DATA

Location:	Portage la Prairie
Vintage:	1950 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	138 square metres above grade, 70 square metres in basement
Interior volume:	470 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	June 1978
Project started:	November 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	horizontal and pitched portions: approx. 90mm loosefill cellulose fibre. side attics: in 2 bedrooms, these have been converted to closets, including uninsulated kneewalls and floors; on either side of large rear dormer, side attics have floors insulated as above, with uninsulated kneewalls.
Main walls:	shiplap both sides, 38X89mm framing, cavities filled with wood shavings.
Basement:	full beamfill, 1.0m above grade. 34m perimeter: 17m panelled with 38X89mm framing and RSI 2.1 glass fibre batts incl. header areas, 17m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG, mainly wood single-hung or fixed types with wood or aluminum storms, 5 DG aluminum sliders.
Air change:	0.22 ac/h natural, kit. exhaust fan, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, ext. chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 19 C.
Humidity:	winter levels moderate, infrequent use of humidifier, some mould growth in basement, some window condensation, dryer vented outdoors.
Remarks:	evidence of moisture damage under two 2nd storey windows.

ENERGY RETROFIT

Initial Proposal:	replace 2 fixed type and 1 opening type window with TG units. replace front door and sidelite with metal, insulated type. on front and 2 sides, apply 38mm semi-rigid glass fibre sheathing and vinyl siding. frame, drywall, and insulate remaining half of basement wall to RSI 3.5. add RSI 4.2 in blown-in cellulose fibre to attics. replace furnace with high-efficiency (approx. 0.90) pulse type.
Audit Findings:	wall, window, door work inappropriate as energy-conservation measures at this time due to poor cost effectiveness. selected air leakage sealing suggested (esp. in upper storey and attic area) to guard against possible moisture damage in the structure. preference changed to high-efficiency (approx. 0.83) induced-draught type. fresh air intake and exhaust systems suggested for humidity control.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip + Basement walls, 17m, RSI 3.5	$ 692	$ 0	$ 692	10500	4.1
Attics, kneewalls, vents	422	247	669	5500	7.5
Furnace; duct and fan materials	1790	900	2690	11000	15.1
Totals	$2904	$1147	$4051	22100	11.3

Change in estimated natural air leakage: 29 % reduction from 0.22 to 0.16 ac/h (new combustion air duct sealed off).

FILE # ED242

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	106 square metres above grade, 63 square metres in basement
Interior volume:	396 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	April 1983
Project started:	November 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	central attic: assumed 89mm wood shavings plus RSI 2.1 glass fibre batts. pitched portions, kneewalls: RSI 2.1 glass fibre batts btwn framing members. side attic floors: approx. 150mm wood shavings.
Main walls:	shiplap both sides, 89mm cavities with RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, 32m perimeter uninsulated.
Doors:	1 @ wood with wood storm door (front door boarded over, front window to be fitted with patio doors - house has only road access from rear).
Windows:	all windows DG single-hung type with storm windows.
Air change:	0.58 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	new energy-efficient gas furnace (spark ignition, vent damper), assumed seasonal efficiency 0.75, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	unknown - house under renovation and no residents since its purchase.
Humidity:	unknown; original window frames exhibit signs of significant moisture levels under previous occupancy; existing airtightness level would suggest low winter humidity; dryer vented outside, humidifier used.
Remarks:	some previous upgrading in the attic areas, but otherwise not much has been done to this house since construction; homeowner currently underway on refinishing and redecorating project including some drywalling.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip selected areas in house by homeowner. replace all windows with TG units, replace door with steel, insulated type. strap exterior walls, apply 38mm rigid glass fibre sheathing, vinyl siding. insulate basement walls on interior to approx. RSI 2.6 level. upgrade attic insulation by RSI 3.5 in accessible areas, add 38mm rigid extruded polystyrene to interior side of pitched portions.
Audit Findings:	window, door, and exterior wall components of proposal all have very poor cost effectiveness with respect to energy saving alone. insulation of basement suggested to RSI 3.5 level. attic proposal modified to include: add RSI 3.5 to horizontal, 75mm rigid expanded polystyrene to kneewalls, 3 vents. sheathing proposal modified to 25mm rigid isocyanurate board (foil-faced). seal, caulk, weatherstrip as part of other major project components. homeowner to fund window and door replacement as renovation work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 32m, RSI 3.5	$1216	$ 500	$1716	12400	8.5
Attic upgrade as above	442	318	760	5800	8.0
Walls as above, 109 m^2	1800	2200	4000	6100	39.9
Totals	$3458	$3018	$6476	23400	16.9
Change in estimated natural air leakage: 27 % reduction from 0.58 to 0.42 ac/h.					

NOTES:

C.2.3 1 3/4, 2 Storey Houses

Pre-1945:	ED 008	Winnipeg
	ED 016	Morden
	ED 021	Winnipeg
	ED 053	Morden
	ED 055	Winnipeg
	ED 069	Brandon
	ED 078	Manson
	ED 099	Brandon
	ED 114	Winnipeg
	ED 148	Winnipeg
	ED 182	Winnipeg
	ED 250	Brandon
1945-70:	ED 014	Winnipeg
	ED 111	Winnipeg
	ED 156	Winnipeg
	ED 197	Winnipeg

FILE # ED008

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2 storey
Wall type:	wood frame, wood siding, 20% covered by aluminum siding
Basement type:	full, stone and mortar
Floor area:	105 square metres above grade, 40 square metres in basement
Interior volume:	378 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	early 1982
Project started:	May 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings plus 250-300mm loosefill cellulose fibre.
Main walls:	shiplap sheathing, approx. 100mm cavities filled with cellulose fibre.
Basement:	partial beamfill, 0.9m above grade, interior parged over original stone. 26m perimeter uninsulated.
Doors:	1 @ wood with wood storm door, 1 @ wood with aluminum storm door.
Windows:	all DG, mostly aluminum sliders except fixed type with wood storms in basement.
Air change:	0.70 ac/h natural.
Heating equipment:	older conventional gas furnace; assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	72 h/wk @ 20 C, 96 h/wk @ 13.5 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low.
Remarks:	major renovation and expansion planned, with energy conservation component.

ENERGY RETROFIT

Initial Proposal: rear of house to be altered substantially with large addition: floor area above grade to increase from 105 to 141 square metres, house volume from 378 to 504 cubic metres; new walls to be energy-efficient construction and to merge with new single strapped wall to be built on to existing house (framed and insulated with RSI 2.1 glass fibre batts); substantial sealing, caulking, weatherstripping to be done as part of the project.

work to include TG windows to replace existing dining room and stairway windows and DG sliders to be added to existing DG windows in other locations; entries to have installed steel, insulated doors.

frame and insulate basement walls from interior to RSI 3.5 level with glass fibre batts.

Audit Findings: only energy-related changes to the existing portion of the building are considered for retrofit, but evaluation is based on the assumption that the addition is already constructed, i.e., basic case is a larger building than the original dwelling.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Front door, windows, DG, 5m^2	-	-	$1543	4700	20.2
Strapped wall system, 122m^2	-	-	6760	11200	36.9
Basement walls, 26m, RSI 3.5	-	-	1310	17800	4.5
Totals	-	-	$9613	34300	17.2
Change in estimated natural air leakage: 26 % reduction from 0.70 to 0.52 ac/h.					

FILE # ED016

GENERAL DATA

Location:	Morden
Vintage:	pre-1920 (est.)
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	187 square metres above grade, 84 square metres in basement
Interior volume:	616 cubic metres
Heating system:	oil, forced air
Occupants:	5
Occupancy:	1977
Project started:	November 1983
Project completed:	August 1984

PRE-PROJECT HOUSE

Ceilings:	house ceiling: 350mm loosefill cellulose fibre, gable vents. pitched portions: 140mm loosefill cellulose fibre between rafters. root cellar ceiling: RSI 3.5 batts between approx. 38X190mm rafters.
Main walls:	2 layers of wood siding on exterior, lath and plaster with drywall cover on interior, approx. 90mm cavities filled with blown-in cellulose fibre.
Basement:	0.3m above grade, header areas uninsulated. 50m perimeter, 12m of which is 200mm concrete, remainder stone and mortar, all uninsulated.
Doors:	2 @ wood with wood storm doors; one entry insulated with RSI 1.4 batts.
Windows:	1 DG vinyl slider, 4 DG aluminum vertical silders, 5 TG sealed units, 8 TG vinyl sliders, 1 SG fixed window.
Air change:	0.58 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace (installed 1974), assumed seasonal efficiency 0.65; approx. 2-3 cords per year burned in fireplace and wood stove; exterior chimney; electric baseboard heater in basement bedroom.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 19.5 C; winter basement temp. approx. 19 C.
Humidity:	winter levels low, humidifier used throughout winter, dryer vented outdoors, minimal window condensation.
Remarks:	well-maintained older house.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. replace DG windows with TG units; replace doors with steel, insulated type. upgrade wall insulation with rigid material, siding on top half of house. frame and insulate basement walls on interior to RSI 3.5 level. add more cellulose fibre to attic. replace oil heating system with wood/electric.
Audit Findings:	appropriate method adopted for upper envelope: 38X64mm strapping, RSI 1.4 glass fibre batts, spun-bonded air barrier, fibreboard sheathing, vinyl siding; approx. 46m perim. incl gables and dormers to be covered. window replacement and attic upgrade not cost effective. door replacement to form small portion of total project cost.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	-	-	-	6600	-
Upper walls, 2 doors	-	-	-	11000	-
Basement walls, 43m, RSI 3.5	-	-	-	15900	-
20 kW electric furnace, service	-	-	-	22500	-
Totals	-	-	$9133	38400	8.2
Change in estimated natural air leakage: 13 % reduction from 0.58 to 0.50 ac/h.					

FILE # ED021

GENERAL DATA

Location:	Winnipeg
Vintage:	1921 (est.)
Style:	one and three-quarter storey
Wall type:	hollow-core masonry, stucco
Basement type:	full, concrete
Floor area:	94 square metres above grade, 47 square metres in basement
Interior volume:	346 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	June 1978
Project started:	June 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	horizontal portions: 140mm wood wool to joist tops plus 300mm blown-in loosefill cellulose fibre. pitched ceilings: wood wool between 89mm rafters.
Main walls:	enclosed air spaces and lath on interior side of hollow tiles.
Basement:	full beamfill, 1.0m above grade, header areas insulated with RSI 2.1 batts. 28m perimeter: insulated full depth with 38mm rigid extruded polystyrene board, 14m of perimeter has additional framing and RSI 2.1 glass fibre batts from joists to 0.4m below grade.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG single-hung and fixed types with wood or aluminum storms.
Air change:	0.44 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20.5 C; winter basement temp. approx. 18 C.
Humidity:	winter levels medium, dryer vented outdoors.
Remarks:	energy-conservation project desirable because of uninsulated walls.

ENERGY RETROFIT

Initial Proposal:	caulk around windows, weatherstrip doors. exterior-wall retrofit with rigid material or strapping and glass fibre batts to approx. RSI 2.1 level, finish with foam-backed aluminum siding. replace furnace with high-efficiency, condensing type.
Audit Findings:	cost of single wall retrofit is relatively high, but, because exterior stucco finish is in need of repair/upgrading, opportunity should be taken to insulate walls. air sealing suggested for selected areas where air leakage noted. low priority to upgrade basement insulation further, but homeowners plan to insulate and finish the above- and slightly below-grade portions from the exterior as a complement to the exterior wall retrofit. furnace replacement proposal reduced to medium-efficiency (approx. 0.75) furnace in order to keep total project cost below programme maximum.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 142	$ 0	$ 142	-	-
Exterior walls, 125m^2, add RSI 2.1	-	-	8514	26300	19.9
Furnace replacement	-	-	1628	6400	15.6
Totals	-	-	$10284	29200	21.6

Change in estimated natural air leakage: 22 % reduction from 0.44 to 0.34 ac/h.

FILE # ED053

GENERAL DATA

Location:	Morden
Vintage:	1903
Style:	one and three-quarter storey
Wall type:	wood frame and concrete, wood siding
Basement type:	full, stone and mortar
Floor area:	176 square metres above grade, 65 square metres in basement
Interior volume:	669 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1978
Project started:	September 1983
Project completed:	October 1983

PRE-PROJECT HOUSE

Ceilings:	main attic: approx. 75mm wood shavings plus 125mm loosefill cellulose fibre. pitched portions: uninsulated spaces between rafters.
Main walls:	shiplap both sides with approx. 100mm cavities filled with concrete.
Basement:	partial beamfill, 0.2m above grade, header area: insulated with glass fibre batts of varying thicknesses. 35m perimeter: drywall finish over 38X89mm framing and 2 layers of RSI 1.8 glass fibre batts.
Doors:	1 @ wood which opens to small enclosed storm porch. 2 @ steel, insulated doors, one with wood storm door, one opens to porch.
Windows:	most have been replaced recently with TG fixed and casement types (12mm spacings), some remaining DG single-hung plus storm types.
Air change:	0.44 ac/h natural, no exhaust fans.
Heating equipment:	conventional gas furnace in poor condition, assumed seasonal efficiency 0.60; supplementary wood heater; interior chimneys for both.
Domestic hot water:	natural gas.
Temp. settings:	unknown.
Humidity:	winter levels low.
Remarks:	large and attractive old house, difficult to insulate concreted wall cavities on interior or exterior without incurring significant cost.

ENERGY RETROFIT

Initial Proposal:	sheet exterior walls with 38mm rigid extruded polystyrene board and apply vinyl siding (wall cavities presumed by homeowner to be empty). replace furnace with high-efficiency (approx. 0.90) pulse type.
Audit Findings:	thought to be more appropriate to use blown-in loosefill material for empty wall cavities before covering with semi-rigid glass fibre sheathing and narrow-board vinyl siding to preserve original character of house; concrete filling discovered during test drilling of cavities to determine contents; subsequently decided to attach 38X64mm strapping, insulate with RSI 2.1 glass fibre batts, sheath with fibreboard, cover with spun-bonded polyolefin air barrier, apply vinyl siding. house could benefit from extensive air leakage sealing effort. furnace choice changed to medium efficiency (approx. 0.75) unit to reduce total retrofit cost (spark ignition, vent damper).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 229	$ 0	$ 229	4800	3.3
Main walls, 5.5X42m, RSI 2.1	5350	4000	9350	34900	18.5
Energy-efficient furnace	1187	0	1187	19000	4.3
Totals	$6766	$4000	$10766	48900	15.2
Change in estimated natural air leakage: 8 % reduction from 0.44 to 0.41 ac/h.					

FILE # ED055

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920 (est.)
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	112 square metres above grade, 46 square metres in basement
Interior volume:	434 cubic metres
Heating system:	oil/electric, forced air/baseboard, two-thirds/one-third
Occupants:	6
Occupancy:	1972
Project started:	July 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	main ceiling: 150mm wood shavings covered with RSI 3.5 glass fibre batts. ceiling over 8 square metre kitchen addition (upper floor has unheated porch): joist spaces likely contain blown-in loosefill cellulose.
Main walls:	128/38/14 gross square metres insulated with blown-in cellulose fibre/empty/RSI 3.5 batts, respectively.
Basement:	partial beamfill, 1.2m above grade. 27m perimeter: approx. 13m with RSI 1.8 batts, 14m uninsulated. kitchen floor over crawl space: RSI 3.5 glass fibre batts between joists.
Doors:	3 @ wood with wood storm doors.
Windows:	mostly TG in winter: single-hung or fixed types with exterior storms and winter interior polyethylene storms; basement and one kitchen window DG single with storm; one kitchen DG aluminum slider.
Air change:	approx. 0.53 ac/h natural (windy test conditions), 2 upper-level exhaust fans, no fresh air intake to return air duct.
Heating equipment:	oil furnace more than 30 years old, assumed seasonal efficiency 0.65, interior chimney; electric heaters totalling 5.5 kW.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21.5 C, 56 h/wk @ 20 C; winter basement temp. approx. 17 C.
Humidity:	winter levels medium, portable humidifier used, dryer vented outdoors.
Remarks:	ongoing upgrading programme with homeowner providing labour.

ENERGY RETROFIT

Initial Proposal:	seal, caulk foundation and floor joist areas in basement. replace 2 main floor doors with steel, insulated types, upgrade frame areas. insulate basement walls on interior to RSI 3.5 level (2 uninsulated walls) or RSI 5.3 (2 already insulated walls). convert off-oil to high-efficiency (approx. 0.90) natural gas furnace and improve supply-air and return-air ducting.
Audit Findings:	additional attic insulation, upper envelope air seal are lower priorities. door replacement not cost effective but could be done as minor item in a retrofit package consisting mainly of cost effective components. off-oil, basement, air sealing work appropriate.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Attic insulation, 52m^2, RSI 3.5	$ 188	$ 0	$ 188	800	7.8
Minor air seal, upper levels	186	0	186	-	-
Basement walls, 27m, add RSI 3.5	423	0	423	13500	1.0
High-efficiency natural gas	2550	300	2850	9500	4.6
Totals	$3346	$ 300	$3646	20100	4.5

Change in estimated natural air leakage: 7 % reduction from 0.53 (approx.) to 0.49 ac/h.

FILE # ED069

GENERAL DATA

Location:	Brandon
Vintage:	1913
Style:	2 storey
Wall type:	wood frame, 50% stucco, 50% wood siding (shakes)
Basement type:	full, concrete
Floor area:	132 square metres above grade, 57 square metres in basement
Interior volume:	494 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	July 1973
Project started:	October 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	blown-in loosefill cellulose fibre to RSI 5.3 level.
Main walls:	shiplap both sides, approx. 100mm cavities filled with cellulose fibre.
Basement:	partial or full beamfill, 0.9m above grade. 29m perimeter framed and insulated with RSI 2.1 glass fibre batts full depth including header areas: approx. 75% is panelled, remainder is exposed polyethylene vapour barrier. 11 square metre living room floor over crawl space insulated with RSI 1.2 plus RSI 2.1 batts; crawl space walls above grade insulated with RSI 3.5 batts (living room floor still cold: possible air leakage area.
Doors:	2 @ wood with aluminum storms.
Windows:	mixture of vintages, all DG: predominantly single-hung types with aluminum storms, fixed or casement with wood storms, 1 fixed/awning combination and 1 sealed unit (12mm spacings), and 1 horizontal vinyl slider.
Air change:	0.43 ac/h natural, bathroom and kitchen fan.
Heating equipment:	gas boiler conversion (orig. coal), assumed seasonal efficiency 0.55, interior chimney; 2 supplementary electric baseboard heaters.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low, portable humidifier used, dryer vented outdoors.
Remarks:	house extremely well-kept over the years.

ENERGY RETROFIT

Initial Proposal:	replace most windows with TG units. seal, caulk, weatherstrip most areas of house by homeowner. top up attic insulation by adding approx. RSI 2.1 loosefill glass fibre, seal leaky hatch, add one roof vent. replace old boiler with more energy-efficient type.
Audit Findings:	attic insulation low priority, but sealing to prevent attic condensation is high priority. preferred boiler replacement is high-efficiency (approx. 0.80) type with circulation pump. contractor to do air leakage sealing work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 592	$ 700	$1292	3900	23.0
Attic upgrade as above	210	95	305	1000	21.3
High-efficiency boiler	3280	990	4270	18500	15.9
Totals	4082	1785	5867	21500	16.9

Change in estimated natural air leakage: 48 % reduction from 0.43 to 0.22 ac/h.

FILE # ED078

GENERAL DATA

Location:	Manson
Vintage:	1913 (additions in 1980, 1983 in progress)
Style:	one and three-quarter storey
Wall type:	wood frame, hardboard siding
Basement type:	full, concrete under original house, crawl space under 1980 addition
Floor area:	126 square metres above grade, 44 square metres in basement
Interior volume:	441 cubic metres
Heating system:	oil, forced air
Occupants:	6
Occupancy:	April 1975
Project started:	February 1984
Project completed:	July 1984

PRE-PROJECT HOUSE

Ceilings:	horizontal portion of original building: 38mm loosefill cellulose fibre. pitched portions: loosefill cellulose fibre between rafters. 1980 addition: RSI 3.5 glass fibre batts.
Main walls:	orig. bldg: int. shiplap, RSI 2.1 batts, 25mm extruded polystyrene board. 1980 addition: 38X140mm framing, RSI 3.5 batts, 10mm plywood sheathing.
Basement:	1.0m above grade, pony wall, joists, headers 0.5m high on top of concrete. 33m perimeter: header areas and pony wall insulated with RSI 3.5 glass fibre batts, entire perimeter of concrete portion to floor uninsulated.
Doors:	1 @ solid wood door with no storm door.
Windows:	3 DG vinyl sliders, 2 DG awning types, 2 DG sealed units, 1 TG vinyl slider, and 4 single-hung wood windows of which 3 have storms.
Air change:	construction prevented test, no exhaust fans or fresh air intake.
Heating equipment:	oil furnace installed in 1967, assumed seasonal efficiency 0.65, interior chimney; supplementary 1.5 kW electric heater used during the day.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 18 C, 56 h/wk @ 15.5 C; winter basement temp. approx. 15.5 C.
Humidity:	winter levels low, humidifier used.
Remarks:	1983 south addition: 38X140mm frame construction, pressure-treated wood basement, RSI 3.5 batt insulation in bas't, walls, cathedral ceiling.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house; insulate south wall to RSI 3.5. replace south windows with TG units, door with metal, insulated type. frame and insulate basement interior to RSI 4.9 level. insulate ceiling to RSI 6.3 with glass fibre batts in attic and rigid insulation on interior, refinish and air seal upper envelope. modify oil furnace to improve efficiency.
Audit Findings:	for ease of construction, suggested to insulate basement and crawlspace perimeter with 50mm rigid extruded polystyrene board on exterior from mid-height of header to 0.3m below grade plus 1.0m horizontal skirt 0.3m below grade (interior insul. wood basement under 1983 addition). south wall upgrading incl. windows, door is renovation work: not fundable. reasonable: north and dormer window replacement, interior storms on others. suggested oil-to-electric conversion: homeowners prefer wood/elec. combo.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 185	$ 0	$ 185	4200	1.5
Basement and attic as above	2560	1338	3898	16300	8.0
Wood/electric furnace	3605	903	4508	20100	6.6
Windows, north and dormer, storms	2509	0	2509	2500	33.2
Totals	$8859	$2241	$11100	32300	10.8

Change in estimated natural air leakage: unknown reduction to final 0.31 ac/h.

FILE # ED099

GENERAL DATA

Location:	Brandon
Vintage:	1920 (est.)
Style:	2 storey
Wall type:	wood frame, wood siding (shakes) covered with stucco.
Basement type:	full, concrete
Floor area:	155 square metres above grade, 68 square metres in basement
Interior volume:	564 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	mid-1981
Project started:	October 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	main portion: loosefill cellulose fibre to RSI 4.9 level, 2 gable vents. east extension: loosefill cellulose fibre to RSI 2.1 level.
Main walls:	shiplap both sides, 89mm cavities filled with blown-in cellulose fibre. some walls face unheated porch or garage; east extension floor over porch.
Basement:	partial beamfill, 1.0m above grade, 35m perimeter uninsulated 250mm concrete (top 0.65m of wall is 100mm concrete with 19mm boards both sides).
Doors:	1 @ single wood door to outdoors from basement, 2 @ single wood doors which open to unheated porches, 2 @ wood with aluminum storm doors.
Windows:	6 DG single-hung or fixed types with wood storms, 3 DG aluminum sliders, 2 DG vinyl sliders, 2 SG windows facing enclosed porch.
Air change:	0.54 ac/h natural, bathroom exhaust fan, no fresh air intake.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary electric baseboard heaters on 2nd floor, 2 in den, 1 in each bedroom.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 15.5 C; winter basement temp. approx. 14 C.
Humidity:	winter levels moderate, humidifier used, dryer vented outdoors, window condensation on 2nd floor.
Remarks:	upper envelope penetrations have led to attic moisture problems in the past.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and 2 windows. upgrade DG windows on south, upgrade to or replace with TG on other walls. frame and insulate basement walls to RSI 3.5 level, raise attic to RSI 7.0. insulate floor of east extension which is above unheated porch, also side entranceway to basement and refrigerator alcove.
Audit Findings:	major air sealing effort by contractor would be appropriate, but could be covered largely within basement, attic, and other components. high-efficiency (approx. 0.83) induced-draught furnace added to proposal.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 215	$ 392	$ 607	5800	7.2
Upgrade 12 windows	1148	300	1448	1700	59.7
Misc. wall and floor insulation	1172	1290	2462	4600	37.0
Basement walls, 35m, RSI 3.5	1125	1300	2425	20100	8.3
Attic upgrade, 89m^2, to RSI 7.0	132	330	462	3800	8.4
Induced-draught furnace, thermostat	-	-	1950	14800	9.1
Totals	-	-	$9354	39200	16.5

Change in estimated natural air leakage: 29 % reduction from 0.54 to 0.39 ac/h.

FILE # ED114

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	one and three-quarter storey
Wall type:	hollow-core masonry, stucco
Basement type:	full, concrete
Floor area:	109 square metres above grade, 54 square metres in basement
Interior volume:	407 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	February 1983
Project started:	August 1983
Project completed:	December 1983

PRE-PROJECT HOUSE

Ceilings:	horizontal and pitched portions: 100mm wood shavings, unvented space.
Main walls:	enclosed air spaces with lath on both sides of hollow tiles, uninsulated.
Basement:	full beamfill, 0.8m above grade, 30m perimeter uninsulated.
Doors:	3 @ wood with wood storms, all opening to enclosed porches.
Windows:	all DG single-hung type with aluminum storms, except hollow glass blocks in basement, and DG fixed wood type with wood storms in living room and dining room.
Air change:	0.36 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace more than 20 years old, assumed seasonal efficiency 0.65, interior chimney; open fireplace with interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20.5 C, 56 h/wk @ 20 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low to medium, humidifier not operating, dryer vented indoors.
Remarks:	home in good condition, main floor porches relatively weather-tight, usable.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by contractor.
insulate basement walls from interior to RSI 3.5 level.
seal and ventilate attic and install RSI 5.6 blown-in loosefill glass fibre.
insulate pitched ceilings with blown-in loosefill glass fibre.
replace furnace with high-efficiency type.
alter fireplace to reduce loss of house air (glass doors, ext. air supply).

Audit Findings:
high-efficiency (approx. 0.90) furnace recommended because of difficulty of upgrading wall insulation.
other proposed measures appropriate and cost effective, except insulation of pitched ceilings which are already filled with wood shavings, and fireplace work which would be considered to be renovation.
sealing, caulking, weatherstripping included with basement and attic work.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 30m, RSI 3.5	$ 895	$ 723	$1618	15200	6.6
Attic upgrade, 33m^2, add RSI 5.6	258	116	374	4500	5.1
Condensing furnace	2368	421	2809	17200	10.0
Totals	$3541	$1261	$4802	31400	9.4

Change in estimated natural air leakage: 17 % reduction from 0.36 to 0.30 ac/h.

FILE # ED148

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920 (est.)
Style:	2 storey
Wall type:	wood frame, stucco
Basement type:	full, concrete to grade, brick above grade
Floor area:	167 square metres above grade, 77 square metres in basement
Interior volume:	637 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	August 1982
Project started:	August 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	150mm wood shavings covered with RSI 3.5 glass fibre batts.
Main walls:	shiplap both sides, approx. 100mm cavities filled with wood shavings.
Basement:	partial beamfill, 0.8m above grade, 39m perimeter uninsulated.
Doors:	1 @ wood with wood storm door, 1 @ wood with aluminum storm door.
Windows:	all DG, mostly single-hung and fixed types with wood or aluminum storms.
Air change:	0.58 ac/h natural, basement bathroom exhaust fan, no fresh air intake.
Heating equipment:	old gas boiler conversion, assumed seasonal efficiency 0.60, interior chimney; supplementary electric baseboard heater in room over garage.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20.5, 56 h/wk @ 18 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low, dryer vented outdoors, portable humidifier used, some upper level window condensation.
Remarks:	very good condition including foundation; one room on upper level extends over the garage and is characterized by cold floor.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by contractor.
replace 9 kitchen and sunroom windows with TG units.
insulate 3 exterior walls and floor of room over garage with blown-in loosefill glass fibre.
frame and insulate basement walls from interior to RSI 3.5 level with glass fibre batts.
additional RSI 3.5 blown-in loosefill glass fibre to be installed in attic.
seal off boiler room from house, install combustion air duct, insulate boiler and DHW tank and associated water lines, install manual valve in fireplace chimney for use in periods when not operated.

Audit Findings:
proposal components reasonable except for poor expected payback for window replacement; attic upgrade is lower priority but not a high cost item.
upgrading of mechanical system as proposed could increase efficiency 0-10%.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 410	$ 425	$ 835	10500	4.9
Insul: closet/pantry/room over garage	177	503	680	9400	4.4
Basement walls, 39m, RSI 3.5	1085	1085	2170	21400	6.2
Attic, 85m^2, add RSI 3.5	369	165	534	1400	23.3
Mechanical system upgrade	446	371	817	14100	3.6
Fireplace cap	109	54	163	-	-
Totals	$2595	$2604	$5199	50700	6.3

Change in estimated natural air leakage: 35 % reduction from 0.58 to 0.38 ac/h.

FILE # ED182

GENERAL DATA

Location:	Winnipeg
Vintage:	1917 (est.)
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	83 square metres above grade, 40 square metres in basement
Interior volume:	319 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	March 1982
Project started:	August 1983
Project completed:	May 1984

PRE-PROJECT HOUSE

Ceilings:	65mm loosefill cellulose fibre between 89mm ceiling joists, attic unvented.
Main walls:	shiplap exterior sheathing, cavities appear to be uninsulated.
Basement:	full beamfill (mortar fill), 1.3m above grade, 26m perimeter uninsulated.
Doors:	3 @ single wood doors, all opening to unheated porches.
Windows:	all DG single-hung or fixed wood types with mainly aluminum storms, except 2 DG vertical aluminum slider units.
Air change:	0.96 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	energy-efficient gas furnace (spark ignition, vent damper), assumed seasonal efficiency 0.75, interior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 16.5 C, 56 h/wk @ 21 C; approx. winter basement temp. 13 C.
Humidity:	winter levels low, no humidifier.
Remarks:	homeowners plan to modernize while maintaining original exterior appearance.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by homeowner.
replace 4 living room, 2 dining room, 1 stairwell, 1 master bedroom, and 4 basement windows with TG units, by homeowner.
strip walls from interior, fur out studs, install RSI 3.5 glass fibre batts, 6 mil polyethylene vapour barrier, drywall.
6 mil vapour barrier to be placed over ceiling joists, edges caulked, 2 layers of RSI 3.5 glass fibre batts to be added.
insulate basement to RSI 2.1 level.

Audit Findings:
homeowners not experienced carpenters, but plan to supply own labour.
decision made to cut open all partitions and ceiling areas so v.b. can be continuous along exterior of envelope.
basement insulation to be RSI 3.5 to 200-300mm above floor to keep footings warm, prevent freeze-thaw damage; mortar in header areas to be broken out to the header and glass fibre batts to be installed (air leakage could be increased by this approach, but air sealing is possible).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Window replacement as proposed	$2139	$ 0	$2139	1500	85.0
Wall retrofit, 142m^2, RSI 3.5	1465	0	1465	28700	3.1
Basement walls, 26m, RSI 3.5	830	0	830	18200	2.8
Attic, 42m^2, RSI 7.0	464	0	464	4900	5.8
Seal, caulk, weatherstrip	95	0	95	-	-
Totals	$4992	$ 0	$4992	52800	5.8

Change in estimated natural air leakage: test data implies increase from approx. 0.96 ac/h, but estimated change not determined due to unusual wind conditions and alteration to house exterior.

FILE # ED250

GENERAL DATA

Location:	Brandon
Vintage:	1908 (est.)
Style:	one and three-quarter storey with additions
Wall type:	double brick
Basement type:	full, stone and mortar (brick under additions)
Floor area:	126 square metres above grade, 62 square metres in basement
Interior volume:	468 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	October 1980
Project started:	February 1984
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	main attic/additions and side attics: 350/300mm batts and loosefill glass fibre. pitched portions: loosefill glass fibre between rafters. kneewalls: RSI 2.1 glass fibre batts.
Main walls:	double brick with approx. 90mm air gap, strapped interior, lath and plaster.
Basement:	1.0-1.5m above grade (grade has slight slope). 37m perimeter: 8m framed with RSI 3.5 glass fibre batts including header area, remainder uninsulated.
Doors:	3 @ french doors opening to enclosed entranceways. 1 @ wood door.
Windows:	mainly DG single-hung type with wood storms, some wood sealed units with vinyl sliders below, a few TG units.
Air change:	0.71 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	gas boiler conversion, assumed seasonal efficiency 0.55, interior chimney; fireplace used occasionally, portable electric heater in use.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 21 C, 56 h/wk @ 19 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low, no humidifier, dryer vented outdoors.
Remarks:	attractive old home unsuited to main wall retrofits as a result.

ENERGY RETROFIT

Initial Proposal:	weatherstrip front and rear entranceways. replace basement entrance door with steel, insulated type. insulate door to cold storage room with rigid material. frame, drywall, and insulate basement walls to RSI 3.5 level. replace boiler with high-efficiency pulse type and DHW companion heater.
Audit Findings:	DHW portion of proposal not considered as energy-conservation measure. boiler choice changed to high-efficiency (approx. 0.80) type with circulation pump and setback thermostat.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 221	$ 0	$ 221	8100	0.5
Doors as above	250	200	450	600	48.2
Basement walls, 37m, RSI 3.5	1950	2050	4000	17700	15.6
Boiler replacement as above	-	-	5349	40200	9.2
Totals	-	-	$10020	56000	12.3
Change in estimated natural air leakage: 35 % reduction from 0.71 to 0.46 ac/h.					

FILE # ED014

GENERAL DATA

Location:	Winnipeg
Vintage:	1961
Style:	2 storey
Wall type:	wood frame, 88% stucco, 12% wood siding
Basement type:	full, concrete
Floor area:	111 square metres above grade, 52 square metres in basement
Interior volume:	401 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	November 1976
Project started:	July 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	vermiculite to tops of joists with blown-in rock wool to RSI 6.3 level.
Main walls:	38X89mm framing with approx. RSI 1.2 glass fibre batts.
Basement:	full beamfill, 0.8m above grade, headers areas uninsulated. 29m perimeter: 3m with 38X38mm framing and panelling and 38mm glass fibre batts, 26m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG sashless sliders except living room DG sealed (12mm spacing) units and 2 basement DG aluminum-slider type with storms.
Air change:	0.21 ac/h natural, closed-off kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; wood-burning fireplace with exterior air supply and exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; approx. winter basement temp. 17 C.
Humidity:	winter levels medium to high, portable humidifier used, dryer vented outdoors, occasional frosting of electrical outlets.
Remarks:	

ENERGY RETROFIT

Initial Proposal:	replace 9 windows with TG units, replace doors with steel, insulated type. insulate basement walls from interior to RSI 2.1 level.
Audit Findings:	appropriate basement insulation level would be RSI 3.5 on 19m, 38mm rigid extruded polystyrene board and cover in laundry room area on 7m where space is restricted, and existing materials on remaining 3m portion. window and door replacement not cost effective, but because existing window frames do not protrude beyond drywall finish, this is an ideal case for application of interior acrylic-type 3rd glazing with excellent opportunity for a good air seal to eliminate infiltration/exfiltration through sashless sliders. because existing furnace is rusting and has only limited service life remaining, an appropriate retrofit project component would be replacement with high-efficiency (approx. 0.90) unit, and a fresh air intake to the return air duct.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal, caulk, weatherstrip	$ 110	$ 0	$ 110	900	7.2
Basement walls, 26m, as above	-	-	1040	11400	5.6
Interior 3rd panes, 10.5m^2	-	-	985	3200	18.8
Condensing furnace, fresh air intake	-	-	2650	10900	14.9
Totals	-	-	$4785	21500	13.7
Change in estimated natural air leakage: 38 % reduction from 0.21 to 0.13 ac/h.					

FILE # ED111

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50
Style:	2 storey
Wall type:	wood frame, 87% stucco, 13% brick
Basement type:	full, concrete
Floor area:	106 square metres above grade, 47 square metres in basement
Interior volume:	379 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1968
Project started:	September 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	115mm wood shavings between joists, 2 gable vents.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.9m above grade, header areas uninsulated. 28m perimeter: 14m with 38X38mm framing, RSI 1.2 glass fibre batts, panelling, 14m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG: sealed units (narrow spacing) in living room, dining room, kitchen, aluminum horizontal sliders in 2 south bedrooms, elsewhere single-hung types with aluminum storms except wood with wood storms in basement.
Air change:	0.41 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace approx. 23 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to medium, portable humidifier used occasionally, dryer vented outdoors.
Remarks:	typical post-war 2 storey house for the region; storm windows have been improved and some windows replaced in recent years, and a poorly insulated recreation room has been constructed.

ENERGY RETROFIT

Initial Proposal:	insulate entire basement interior perimeter to RSI 3.5 level. add blown-in loosefill glass fibre to attic to RSI 7.0 level, add 2 vents. replace furnace with high-efficiency (approx. 0.90), condensing type.
Audit Findings:	proposed retrofit components are the obvious ones and the simple ones for this house, which is a classic case. some selected air tightening work could be done as well, but attic and basement work should be accompanied by some air sealing anyway.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 28m, RSI 3.5	$1169	$ 731	$1900	8700	13.5
Attic upgrade, 54m^2, add RSI 5.0	328	226	554	4500	7.5
Condensing furnace	1850	500	2350	12600	11.5
Totals	$3347	$1457	$4804	22100	13.3
Change in estimated natural air leakage: 33 % reduction from 0.41 to 0.27 ac/h.					

FILE # ED156

GENERAL DATA

Location:	Winnipeg
Vintage:	1946
Style:	2 storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	114 square metres above grade, 54 square metres in basement
Interior volume:	421 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	June 1982
Project started:	August 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings (approx. RSI 1.8), poorly ventilated attic space.
Main walls:	38X89mm framing, RSI 1.2 mineral wool, stucco.
Basement:	full beamfill, 0.8m above grade, header uninsulated. 30m perimeter: 45% of above- and below-grade perimeter uninsulated, 55% insulated with RSI 1.4 glass fibre batts with panelled finish.
Doors:	2 @ wood with wood storms.
Windows:	all DG: alum. sliders or original wood fixed and single-hung types with wood or alum. storms.
Air change:	0.27 ac/h natural; no exhaust fans or fresh air intake to return air duct.
Heating equipment:	orig. coal unit conv. to oil to nat. gas, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	56 h/wk @ 15 C, 56 h/wk @ 17 C, 56 h/wk @ 20 C.
Humidity:	winter humidity levels medium; no humidifier used.
Remarks:	overall condition very good.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by homeowner. replace windows with triple glazed units. upgrade attic insulation to RSI 7.0 (57 sq. m), add roof and turbine vents and seal all penetrations through ceiling. replace furnace with induced-draught energy-efficient type (0.83) by homeowner who is experienced in heating system installation. replace natural gas DHW tank with electric DHW tank, insulate water lines.
Audit Findings:	insulate uninsulated 55% portion of basement wall to RSI 3.5. seal, caulk, weatherstrip homeowner kit suggested. window replacement not cost-effective. turbine vent not required in attic upgrade. furnace replacement cost-effective. DHW tank to be replaced as renovation measure.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Upgrade attic (blown glass fibre)	$ 456	$ 192	$ 648	6200	6.5
Basement walls, 30m, RSI 3.5	873	582	1455	8700	10.2
Seal, caulk, weatherstrip	300	250	550	2300	14.7
Induced-draught furnace	1167	0	1167	9600	7.5
Totals	$2796	$1024	$3820	21900	10.7
Change in estimated natural air leakage: 25 % reduction from 0.27 to 0.20 ac/h.					

FILE # ED197

GENERAL DATA

Location:	Winnipeg
Vintage:	1954
Style:	2 storey
Wall type:	wood frame, 74% stucco, 13% wood siding, 13% stone
Basement type:	full, concrete
Floor area:	100 square metres above grade, 47 square metres in basement
Interior volume:	359 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	1971
Project started:	March 1984
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	wood shavings to tops of 140mm joists.
Main walls:	38X89mm framing with RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, 28m perimeter: 21m panelled with 38X64mm framing and 38mm glass fibre batts, 7m uninsulated.
Doors:	1 @ wood with wood storm door, 1 @ wood with aluminum storm door.
Windows:	basement: DG sashless slider with aluminum slider on exterior; kitchen: DG single-hung type with aluminum storms; living room: TG sealed unit (12mm spacings) with lower DG aluminum sliders; dining room: TG incl. DG sealed unit (12mm spacing) and exterior polyethylene 3rd glazing; remainder: TG incl. single-hung type with aluminum 2nd and polyethylene 3rd glazings on exterior.
Air change:	0.28 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	gas conv. unit (orig. oil), assumed seasonal efficiency 0.65, ext. chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 24 C, 56 h/wk @ 17.5 C; winter basement temp. approx. 19 C.
Humidity:	winter levels medium, humidifier used.
Remarks:	typical 1950-60 2 storey house in excellent condition.

ENERGY RETROFIT

Initial Proposal:
caulk window and door frames.
replace 7 TG windows (single-hung with 2 storms type) with TG slider units.
replace 2 doors with steel, insulated type.
strip stucco, sheet walls above grade and to 0.6m below grade with 50mm rigid extruded polystyrene board, apply vinyl siding and parging.
increase attic insulation with blown-in loosefill cellulose fibre to RSI 7.0 level, add roof vents, air chutes to maintain soffit vent air flow.
replace furnace with high-efficiency (approx. 0.90), condensing type.

Audit Findings:
overall proposed cost exceeds programme allowable maximum.
main wall reinsulation inappropriate because of good condition of existing siding; current interior finish in basement makes exterior approach attractive for upgrading of basement insulation levels.
air seal in selected areas, attic upgrade, high-efficiency furnace, basement utility room insulation to RSI 2.1 level, plus interior or exterior basement wall upgrade to approx. RSI 2.1 would be a reasonable project.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 28m, RSI 2.1	$ 484	$ 864	$1348	5700	14.5
Attic upgrade, 50m^2, add RSI 5.1	301	250	551	3500	9.6
Furnace, elec. DHW, fresh air intake	-	-	3124	9300	20.5
Totals	-	-	$5023	16000	19.2

Change in estimated natural air leakage: -24 % reduction from 0.28 to 0.34 ac/h (new fresh air intake undampered; 7 % reduction to 0.26 ac/h with intake sealed).

NOTES:

C.2.4 2½ Storey Houses

Pre-1945:	ED 003	Winnipeg
	ED 038	Winnipeg
	ED 074	Winnipeg
	ED 106	McCreary
	ED 133	Winnipeg
	ED 135	Beresford
	ED 140	Winnipeg
	ED 168	Winnipeg
	ED 175	Winnipeg
	ED 192	Killarney
	ED 206	Brandon
	ED 229	Winnipeg

FILE # ED003

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	double brick, stucco
Basement type:	full, stone and mortar
Floor area:	156 square metres above grade, 52 square metres in basement
Interior volume:	539 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	May 1982
Project started:	May 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	central, side attics, pitched portions: minimal wood shavings. kneewalls: uninsulated.
Main walls:	uninsulated double brick with furring, lath and plaster on interior.
Basement:	partial beamfill, header uninsulated. 0.9m above grade; above- and below-grade portions have been parged over the original stone and mortar but not insulated.
Doors:	2 @ wood with storms.
Windows:	almost all DG, mostly metal sliders; TG in living room only.
Air change:	0.44 ac/h natural; fresh air intake to return-air duct.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	10 C much of the time; electrical space heaters used when occupants home.
Humidity:	winter humidity levels low to medium.
Remarks:	occupants starting to modernize this aged home which is structurally sound.

ENERGY RETROFIT

Initial Proposal:	insulate entire 30m interior perimeter of basement wall to RSI 3.5 using glass fibre batts; insulate most main walls on upper levels to RSI 3.5 using glass fibre batts from the interior, similarly kneewalls and ceilings on 3rd level; drywall finish, caulk, seal, weatherstrip; homeowner to provide most of labour. replace furnace with condensing, pulse-combustion type. other: fluorescent lighting, dimmers, attic vents, car plug timer, insulate hot water lines, install insulating window blinds, insulate rear porch area.
Audit Findings:	overall proposal reasonable, insulating blinds and rear porch insulation not cost-effective.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Basement, upper level insulation	-	-	$5011	56600	5.4
Furnace replacement	-	-	2530	30400	5.1
Fluor. lighting ... water lines	$ 211	$ 0	211	-	-
Totals	-	-	$7752	71300	6.7
Change in estimated natural air leakage: 5 % reduction from 0.44 to 0.42 ac/h.					

FILE # ED038

GENERAL DATA

Location:	Winnipeg
Vintage:	1893
Style:	2½ storey
Wall type:	wood frame, wood siding under asphalt-coated fibrous siding
Basement type:	full, concrete (not original)
Floor area:	189 square metres above grade, 84 square metres in basement
Interior volume:	709 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	October 1982
Project started:	January 1984
Project completed:	October 1984

PRE-PROJECT HOUSE

Ceilings:	central attic and main floor attic above kitchen: assumed approx. 100mm wood shavings plus RSI 3.5 blown glass fibre. pitched portions: assumed 100mm blown glass fibre. kneewalls: RSI 2.1 glass fibre batts between studs. side attic floors: 200mm shavings plus 50-150mm (uneven) blown glass fibre.
Main walls:	lath and plaster, strapping, shiplap both sides, 100mm cavities filled with blown glass fibre, 2 layers of siding.
Basement:	partial beamfill, 1.1m above grade. 38m perimeter: 7m with 38X89mm framing and RSI 2.1 glass fibre batts full depth incl. header area, 31m uninsulated.
Doors:	2 @ wood with wood storms, one of which opens to enclosed front porch.
Windows:	all DG single-hung or fixed type plus storms, mostly aluminum.
Air change:	structure too large and loose to estimate natural ac/h from airtightness test: some renovation work in progress; assumed 1 ac/h.
Heating equipment:	conventional gas furnace, 15-20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	56 h/wk each @ 18 C, 19.5 C, 21 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low but no static, no exhaust fans, room humidifier used.
Remarks:	original large farmhouse, in need of considerable renovation; homeowner initially proposed $33,000 worth of energy conservation work.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by homeowner during renovations. install insulated shutters on windows, by homeowner. insulate basement walls from interior with 38X64mm framing and RSI 5.6 in glass fibre batts, insulate ducts and water lines. upgrade attic insulation using glass fibre batts and rigid isocyanurate. heat pump, dimmers, timers, fluor. lighting, flow restrictors, and more.
Audit Findings:	many impractical and unnecessary items still in proposal; further, the sheer size of house produces high total cost for project components. well-insulated walls serve to keep annual energy bill relatively low. important to reduce air leakage considerably, improve insulation level and condition of upper envelope, insulate basement (RSI 2.1 now proposed). Cost effective to replace furnace with high-efficiency (approx. 0.90) type.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Air seal, basement, attic	-	-	$3479	24000	8.9
Condensing furnace, ductwork	-	-	3595	21700	10.2
Misc., incl. shutters	$ 485	$ 0	485	4600	6.5
Totals	-	-	$7559	42300	11.0

Change in estimated natural air leakage: approx. 38 % reduction from assumed 1.0 to 0.62 ac/h.

FILE # ED074

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame, wood siding (horizontal and shakes)
Basement type:	full, stone and mortar
Floor area:	189 square metres above grade, 64 square metres in basement
Interior volume:	626 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	September 1982 (likely longer)
Project started:	July 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	central and side attics: wood shavings and cellulose to RSI 7.0. main level: den with assumed 150mm shavings, kitchen with RSI 3.5 batts. kneewalls: RSI 3.5 glass fibre batts.
Main walls:	shiplap sheathing both sides, cavities filled with shavings and cellulose.
Basement:	partial beamfill, 1.1m above grade, 35.5m perimeter parged and uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	3rd level windows and 2nd level bathroom all recent DG or TG sealed units (12-25mm spacings), DG vert. sash type and patio doors in kitchen addition, remainder original DG single-hung or fixed types with wood storms.
Air change:	0.60 ac/h natural, exhaust fans in kitchen and main floor bathroom, no fresh air duct.
Heating equipment:	old boiler converted to natural gas, assumed seasonal efficiency 0.55, interior chimney.
Domestic hot water:	electric.
Temp. settings:	18 C all the time; winter basement temp. approx. 15 C.
Humidity:	winter levels low, no humidifier, dryer vented inside (soon to route out).
Remarks:	3rd level has been completely refinished and redecorated; cold spot on floor of kitchen addition where it passes over rubble foundation wall.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house except 3rd level. replace remaining windows on 1st and 2nd levels with new DG units. insulate basement walls from interior with RSI 3.5 glass fibre batts.
Audit Findings:	ceilings and walls well insulated, little opportunity for improvement. insulation upgrading of kitchen addition floor is suggested, incl. exterior of basement wall above grade in the vicinity of kitchen in order to increase temperature of stone wall and floor above. DG window replacement would only save significant energy via airtightness. lower-priced TG units could replace DG proposed, and overall energy saving with air seal, basement, kitchen floor, windows would be approximately equal to programme requirement.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 418	$ 569	$ 987	11400	5.3
Basement walls, 35.5m, RSI 3.5	-	-	1986	27300	4.5
11 TG windows, 10m^2 glazed area	2775	1850	4625	4800	59.1
Totals	-	-	$7598	39200	11.9
Change in estimated natural air leakage: 23 % reduction from 0.60 to 0.46 ac/h.					

FILE # ED106

GENERAL DATA

Location:	McCreary
Vintage:	1920 (est.)
Style:	2½ storey (one storey addition)
Wall type:	wood frame, wood siding
Basement type:	full, concrete (crawl space under addition)
Floor area:	200 square metres above grade, 94 square metres in basement
Interior volume:	730 cubic metres
Heating system:	oil and wood, forced air
Occupants:	5
Occupancy:	August 1982
Project started:	January 1984
Project completed:	May 1984

PRE-PROJECT HOUSE

Ceilings:	upper level is all pitched ceilings: RSI 2.1 glass fibre batts. upper level kneewalls and side attic floors: RSI 1.4 glass fibre batts. rear addition: 38mm loosefill cellulose fibre plus RSI 3.5 batts.
Main walls:	sheathed both sides, 38X140mm framing, wood shavings and/or blown-in cellulose fibre, some settlement and voids.
Basement:	full beamfill, 0.7m above grade. 45m perimeter: 17m with 38mm rigid expanded polystyrene board full height, 28m uninsulated.
Doors:	2 @ wood doors, one with wood storm door, one opens to enclosed porch.
Windows:	mainly a variety of recent DG units (12mm spacing), 2 single-hung types with storms, 3 SG basement windows, 1 TG sealed/patio door.
Air change:	constr. in progress prevented test, kit. exhaust fan, no fresh air intake.
Heating equipment:	combination oil (approx. 8 years old) with wood add-on furnace (1982), interior chimney; supplementary electric baseboard heater in kitchen.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 15 C; approx. same winter basement temp.
Humidity:	winter levels medium, no humidifier, no window condensation, dryer vented outdoors.
Remarks:	extensive interior renovation underway; roughly 1 cord/wk of poplar in 82/3.

ENERGY RETROFIT

Initial Proposal:	strip old siding, sheet with 38mm rigid extruded polystyrene board to 0.6m below grade, apply new aluminum siding.
Audit Findings:	because of proposed and progressing renovations, it was suggested that wall upgrading more appropriately done from interior, checking wall cavities and insulating as required with RSI 3.5 glass fibre batts as part of renovations, then covering with 38mm extruded polystyrene, vapour barrier, and drywall. sloped ceiling and kneewall areas on upper level could be done similarly, and basement with 38mm extruded polystyrene on interior after moisture-proofing. all interior work to be accompanied by extensive air sealing effort. conversion to electric heat with wood backup suggested: possibly duct heater most suitable because of relatively recent vintage of oil furnace.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Main walls, 220m^2, add RSI 1.3	$2271	$1448	$3719	27400	4.5
Basement walls, 45m, RSI 1.3	1344	857	2201	18500	3.9
Attic upgrade as above	1020	650	1670	8800	6.2
25 kW electric furnace, service	-	-	2295	49300	1.4
Totals	-	-	$9885	77300	4.0

Change in estimated natural air leakage: unknown reduction to 0.35 ac/h.

FILE # ED133

GENERAL DATA

Location:	Winnipeg
Vintage:	1908
Style:	2½ storey
Wall type:	wood frame, wood siding (shakes)
Basement type:	full, stone and mortar
Floor area:	202 square metres above grade, 67 square metres in basement
Interior volume:	714 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	4
Occupancy:	1975
Project started:	October 1983
Project completed:	January 1984

PRE-PROJECT HOUSE

Ceilings:	upper ceiling: approx. 100mm loosefill glass fibre over 75mm wood shavings. kneewalls: assumed 100mm cavities filled with wood sawdust. side attic floors, alcove and porch ceilings: assumed 75mm wood shavings.
Main walls:	shiplap sheathing both sides, 100mm cavities filled with wood sawdust.
Basement:	partial beamfill, 1.2m above grade, parged over stone. 33m perimeter: 16m with 38X38mm strapping and fibreboard panelling but no insulation, 17m uninsulated.
Doors:	2 @ wood with wood storm doors opening to enclosed porches. 1 @ wood with wood storm door.
Windows:	29 square metres of glazed area, almost all DG original single-hung and fixed types with wood or aluminum storms, a few ornamental fixed windows with 2 storms (i.e., TG), several bedroom windows on upper levels with DG aluminum vertical sliders.
Air change:	1.01 ac/h natural, no exhaust fans or fresh air ducts.
Heating equipment:	old boiler converted to natural gas, assumed seasonal efficiency 0.55, interior chimney; supplementary electric heater used in basement.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 15 C.
Humidity:	winter levels low to medium, portable humidifiers used.
Remarks:	extensive interior facelift in progress: energy conservation component is minor, but complementary; rear porch being incorporated as interior space.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace 12 old windows with new alum. DG units, replace 3 doors. insulate basement walls to RSI 3.5 level. insulate attics/kneewall areas to RSI 7.0/3.5 level.
Audit Findings:	air seal, basement, attic work cost effective. difficult to upgrade glazing to TG at reasonable investment because of sheer magnitude of glazed area. walls being redone on interior: suggest strapping, boosting RSI value. for a house this size, boiler replacement to high-efficiency type would be a reasonable measure.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 400	$ 525	$ 925	30200	1.9
Wall insul. upgrade, 150m^2, RSI 4.2	1486	3025	4511	18600	14.9
Basement walls, 33m, RSI 3.5	639	1300	1939	23100	5.2
Attic upgrade, vents	264	86	350	15100	1.4
Totals	$2789	$4936	$7725	64200	7.4
Change in estimated natural air leakage: 54 % reduction from 1.01 to 0.46 ac/h.					

FILE # ED135

GENERAL DATA

Location:	Beresford
Vintage:	1900 (est.)
Style:	2½ storey
Wall type:	wood frame, wood siding
Basement type:	crawl space, pressure-treated wood foundation
Floor area:	179 square metres above grade
Interior volume:	584 cubic metres
Heating system:	electric, forced air
Occupants:	3 (4th expected spring 1984)
Occupancy:	September 1980
Project started:	October 1983
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	central flat ceiling, pitched portions, kneewalls: redone with RSI 3.5 glass fibre batts, some furring, new interior finish. side attic floors: original wood shavings and RSI 3.5 batts (net RSI 4.6).
Main walls:	shiplap both sides, 100mm cavities filled with wood shavings.
Basement:	0.6m above grade, 1.5m full depth, 35m perimeter is 38X140mm framing with RSI 3.5 glass fibre batts to footing, approx. 0.1m above uncovered earth floor; above footing on exterior is a horizontal skirt of rigid extruded polystyrene board (0.8m below grade).
Doors:	2 @ wood with wood storm doors plus one on 2nd floor which is not usable.
Windows:	10 square metres of glazed area, all DG single-hung type with wood storms.
Air change:	1.35 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	25 kW electric furnace approx. 3 years old, suspended from floor joists; supplementary heating via wood stove with interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 10 C; approx. winter basement temp. 13 C.
Humidity:	winter levels low, no humidifier.
Remarks:	house moved to current site in 1980 and placed on new foundation; until upper level upgraded, only main floor used continuously in winter; air leakage represents approx. 50% of total house heat loss.

ENERGY RETROFIT

Initial Proposal:	double-wall retrofit incl. addition of RSI 5.6 in glass fibre batts; project to cover 5.5X35m main wall area, 0.9X35m crawl space wall area to 0.3m below grade, i.e., 224 square metres.
Audit Findings:	because upper envelope and crawl space heavily insulated, the conductive and convective heat loss reduction resulting from the proposal is sufficient to meet programme requirements.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Double-wall retrofit as above	$5700	$5100	$10800	24700	15.8
Totals	$5700	$5100	$10800	24700	15.8

Change in estimated natural air leakage: 82 % reduction from 1.35 to 0.24 ac/h.

FILE # ED140

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame, wood siding (horizontal and shakes)
Basement type:	full, stone and mortar
Floor area:	173 square metres above grade, 60 square metres in basement
Interior volume:	598 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	3
Occupancy:	August 1968
Project started:	October 1983
Project completed:	February 1984

PRE-PROJECT HOUSE

Ceilings:	inaccessible, assumed wood shavings to approx. RSI 2.5.
Main walls:	shiplap sheathing both sides, approx. 140-150mm cavities with blown-in rock wool (circa 1973), possibly some voids (assumed 15%).
Basement:	partial beamfill, 1.1m above grade, previous foundation movement in evidence with new floor slab. 31m perimeter drywalled full height incl. header, 38X89mm framing with RSI 1.4 batts behind and RSI 2.1 batts between studs (mid-1982).
Doors:	3 @ wood with wood storm doors, 1 @ wood with aluminum storm door.
Windows:	all DG single-hung and fixed types with wood or aluminum storms, except one one TG aluminum vertical slider.
Air change:	house very leaky: unreliable test result obtained, 0.60 ac/h natural assumed; kitchen exhaust fan.
Heating equipment:	old coal-fired boiler, converted to oil, then to gas, assumed seasonal efficiency 0.60, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 22 C, 56 h/wk @ 18 C; winter basement temp. under insulated condition approx. 18 C; 3rd level quite cool.
Humidity:	winter levels low, humidifier used sometimes.
Remarks:	house extremely leaky but some moisture added by approx. 100 or more plants.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. top up wall insulation with blown cellulose where previous coverage poor. upgrade 3rd level to RSI 7.0/4.9 on horizontal/vertical surfaces by building out and insulating walls and ceilings on interior or in side attics. install energy-efficient heating plant, with circulation pump.
Audit Findings:	extent of suggested work on 3rd level difficult to estimate without cutting access to the areas. exploratory holes to be drilled in exterior walls to ascertain existing condition before adding insulation. air sealing is a high priority in this house. homeowner interested in pulse-type boiler (approx. 0.90), conversion of old one to wood.

Project Components	Costs of Work Mat'l	Labour	Total	Expected Annual Energy Saving (kWh)	Payback Proxy
Seal, caulk, weatherstrip	-	-	$ 950	8700	6.7
Wall insulation as above	-	-	1100	8700	7.7
Upgrade 3rd level as above	-	-	1400	5000	17.1
Pulse-type boiler	$5011	$ 860	5871	22400	16.1
Totals	-	-	$9321	37300	15.3

Change in estimated natural air leakage: approx. 18 % reduction from assumed 0.60 to 0.49 ac/h.

FILE # ED168

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	133 square metres above grade, 46 square metres in basement
Interior volume:	447 cubic metres
Heating system:	natural gas, gravity hot water
Occupants:	2
Occupancy:	March 1983
Project started:	August 1983
Project completed:	December 1983

PRE-PROJECT HOUSE

Ceilings:	approx. 90mm wood shavings in kneewalls, horizontal, and pitched ceilings.
Main walls:	shiplap sheathing both sides, approx. 90mm cavities with wood shavings, possibly some settlement.
Basement:	partial beamfill, 0.9m above grade, 27m perimeter uninsulated.
Doors:	3 @ wood with aluminum storm doors.
Windows:	all DG, mostly single-hung type with aluminum storms, some fixed wood type with wood storms.
Air change:	0.79 ac/h natural, no exhaust fans.
Heating equipment:	old boiler conversion, assumed seasonal efficiency 0.60, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	new occupancy; temperature settings not yet established.
Humidity:	winter levels unknown by new occupants.
Remarks:	house has had rough treatment at some time in the past and has been vacant for a year.

ENERGY RETROFIT

Initial Proposal:
seal, caulk, weatherstrip entire house by contractor.
replace basement windows, 5 on 2nd level, 4 on 3rd level.
close off rear entry and eliminate use of small rear addition to house.
replace side door with steel, insulated type.
frame and insulate basement to RSI 3.5 level.
increase thermal resistance of 3rd level ceilings, kneewalls, pitched portions, add vents.

Audit Findings:
side door and 2nd level windows in poor condition: reasonable to replace.
due to shallow foundation, suggest RSI 2.1 level for basement walls.
horizontal/vertical surfaces of 3rd level to RSI 7.0/3.5 level.
suggested to explore settlement of wood shavings in walls, top up as req'd.
with tightened basement areas, possible increase in boiler efficiency could be effected by means of a combustion air duct.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 381	$ 389	$ 770	11500	4.1
4 TG windows, 1 wood door	998	484	1482	2300	39.0
Basement walls, 27m, RSI 3.5	740	740	1480	21500	4.2
Attic upgrade as above	361	253	614	3700	10.3
Other: combustion air duct	50	50	100	-	-
Totals	$2530	$1916	$4446	36800	7.4
Change in estimated natural air leakage: 45 % reduction from 0.79 to 0.43 ac/h.					

FILE # ED175

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame, wood siding (horizontal and shakes)
Basement type:	full, stone and mortar
Floor area:	170 square metres above grade, 65 square metres in basement
Interior volume:	599 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	5
Occupancy:	May 1978
Project started:	October 1983
Project completed:	June 1984

PRE-PROJECT HOUSE

Ceilings:	central and side attics: unvented with 100mm wood shavings between joists. kneewalls: shiplap next to lath and plaster, uninsulated. pitched portions: 100mm wood shavings in rafter spaces.
Main walls:	shiplap both sides, 140-150mm cavities filled with wood shavings.
Basement:	partial beamfill, 1.0m above grade, 32m perimeter uninsulated.
Doors:	1 @ wood with aluminum storm door. 2 @ wood opening to enclosed unheated porches, one of which is insulated.
Windows:	all DG single-hung and fixed types with mostly aluminum, and a few wood, storms, except 1 DG aluminum vertical slider in bathroom, and except 4 of the 6 upper-level windows missing their storms, i.e., SG.
Air change:	0.90 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	gas boiler no more than 10 years old in good condition, assumed seasonal efficiency 0.60, interior chimney; supplementary electric space heater (1.5 kW) used in basement for 3 hours per day.
Domestic hot water:	natural gas.
Temp. settings:	approx. 84 h/wk @ 21 C, 84 h/wk @ 18 C; winter basement temp. approx. 14 C.
Humidity:	winter levels low, no humidifier.
Remarks:	previously multiple-family dwelling: still shows the effects of that period.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace 6 windows on 3rd level with TG units. insulate empty walls with loosefill glass fibre, apply vinyl siding. insulate basement wall on interior to RSI 3.5 level with glass fibre batts. insulate attic areas with loosefill glass fibre and batts to RSI 7.0/3.5 levels on horizontal/vertical surfaces, add 9 vents, reshingle. other: setback thermostat, fireplace chimney cap, move car plug timer.
Audit Findings:	exploratory drilling showed that wall cavities filled with wood shavings. air sealing and attic insulation are high priorities in this house. suggest leaving bottom 0.3m of basement wall uninsulated to allow some heat to reach wall to prevent freeze-thaw damage. window proposals for 3rd level are reasonable and could add storm windows to 4 basement windows to make them usable (currently mostly covered).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 522	$ 490	$1012	17500	3.5
Basement walls, 32m, RSI 3.5	840	720	1560	20700	4.6
Attic insulation as above	576	246	822	9600	5.3
Windows on third level, $3m^2$	797	340	1137	2800	25.4
Other: bas't storms, thermostat	207	47	254	-	-
Totals	$2942	$1843	$4785	47900	6.3

Change in estimated natural air leakage: 26 % reduction from 0.90 to 0.67 ac/h.

FILE # ED192

GENERAL DATA

Location:	Killarney
Vintage:	1908
Style:	2½ storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	147 square metres above grade, 73 square metres in basement
Interior volume:	543 cubic metres (incl. heated porch, not incl. unheated upper half storey)
Heating system:	oil, forced air
Occupants:	3
Occupancy:	December 1980
Project started:	January 1984
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	100mm vermiculite in attic floor over 2nd level, 100mm cellulose over porch.
Main walls:	100mm (approx.) cavities empty, ext. sheathing, int. lath and plaster.
Basement:	0.7m above grade, header areas uninsulated. 44m perimeter: 35m is 0.6m thick stone and mortar, 9m is 200mm concrete tunnel to well.
Doors:	3 @ wood with wood storm doors.
Windows:	all DG, half are horiz. vinyl sliders, remainder are vert. vinyl sliders, sealed units, and one patio door.
Air change:	0.44 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace more than 20 years old, no effective return air system, assumed seasonal efficiency 0.60, interior chimney; supplementary electric heaters in bathroom, bedroom, porch.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to moderate, no humidifier, some window condensation, dryer vented indoors.
Remarks:	attic area not used at present.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. add magnetic-type interior 3rd panes to all windows. blow loose polystyrene beads into empty wall cavities. insulate basement walls 1.2m down from joists to RSI 4.9 level. blow loosefill cellulose fibre into attic to RSI 7.0. 6 roof vents and 1 wind-powered vent to attic.
Audit Findings:	on basement upper tunnel walls, ceiling, could use 50mm rigid extruded polystyrene with gypsum board (waterproof) cover due to dampness. homeowners decided to convert attic space to living space by framing, insulating, and finishing kneewalls, pitched, and horizontal portions. homeowners not interested in off-oil conversion due to uncertain future electricity prices.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Seal, caulk, weatherstrip	$ 175	$ 125	$ 300	4200	2.4
Interior 3rd panes, 9.5m^2	1400	635	2035	3300	20.5
Insulate main walls, 5.2X33m	2094	1349	3443	40800	2.8
Basement walls, 44m, RSI 5.6/1.8	1200	760	1960	17000	3.8
Attic upgrade as above	1883	413	2296	11600	6.6
Totals	$6752	$3282	$10034	72800	4.6

Change in estimated natural air leakage: 60 % reduction from 0.44 to 0.17 ac/h.

FILE # ED206

GENERAL DATA

Location:	Brandon
Vintage:	1917
Style:	2½ storey
Wall type:	wood frame, brick
Basement type:	full, concrete
Floor area:	158 square metres above grade, 52 square metres in basement
Interior volume:	508 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	January 1975
Project started:	January 1984
Project completed:	April 1984

PRE-PROJECT HOUSE

Ceilings:	main floor ceiling in rear addition: RSI 7.0 in glass fibre batts. pitched portions: small area in upper part of 2nd storey with approx. 100mm vermiculite between rafters, almost all of upper half storey with RSI 3.5 in glass fibre batts (cathedral-type ceiling).
Main walls:	shiplap sheathing behind brick veneer, approx. 100mm cavities filled with vermiculite, rear addition with RSI 2.1 glass fibre batts, upper half storey end walls with RSI 2.1 plus 1.4 glass fibre batts.
Basement:	full beamfill, 0.5m above grade, 29m perimeter uninsulated full height.
Doors:	3 @ wood doors, with 1 wood and 1 aluminum storm door, 3rd opens to porch.
Windows:	mainly DG vinyl vertical and horizontal sliders, some remaining single-hung or fixed wood types with storms.
Air change:	0.74 ac/h natural, bath. exhaust fan, no fr. air intake to return air duct.
Heating equipment:	conventional gas furnace (approx. 23 years old), assumed seasonal efficiency 0.65, interior chimney; supplementary heat supplied from small fireplace on main floor, and electric heater in bathroom.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 17 C, 56 h/wk @ 20 C; winter basement temp. approx. 15.5 C.
Humidity:	winter levels low to moderate, humidifier used, no window condensation, dryer vented outdoors.
Remarks:	upper level upgrade recent, but v.b. repairs required due to cat damage.

ENERGY RETROFIT

Initial Proposal:	replace 2 living room and 1 basement window with TG units. replace 2 doors with steel, insulated type, and replace rear storm door. frame, drywall, and insulate basement walls to RSI 3.5 level. replace furnace with high-efficiency (approx. 0.90) condensing type, t'stat. replace acorn-type fireplace with more-efficient type stove and install ceiling fan in vicinity.
Audit Findings:	suggested to complete attic v.b. repairs and finish drywall work to protect attic upgrade from moisture damage. house quite leaky to air despite previous air sealing efforts: suggested to do complete air leakage sealing of house. door, window, fireplace, ceiling fan work considered to be renovation work. choice of furnace changed to high-efficiency (approx. 0.90) pulse type. low natural gas consumption likely due to significant use of wood fireplace.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Air seal, incl. finishing attic	$ 654	$ 0	$ 654	7300	6.2
Basement walls, 29m, RSI 3.5	1198	0	1198	16200	5.1
Pulse-type furnace, thermostat	2100	300	2400	20000	8.3
Totals	$3952	$ 300	$4252	33800	8.7

Change in estimated natural air leakage: 52 % reduction from 0.74 to 0.35 ac/h.

FILE # ED229

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	211 square metres above grade, 65 square metres in basement
Interior volume:	691 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	June 1983 (grandmother of new owner has been occupant since 1927 and will remain)
Project started:	November 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	central and side attic horiz. surfaces: approx. 100mm wood chips, sawdust. pitched portions: 100mm wood chips and sawdust between rafters. kneewalls: 100mm wood chips, sawdust held in between studs with cardboard.
Main walls:	shiplap both sides, assumed 100mm cavities partly full with chips, sawdust.
Basement:	full beamfill (interior parged over original stone), 1.1m above grade. 36m perimeter uninsulated, including header; 7 square metre cold room. floor of 16 square metre rear main floor addition over crawl space: approx. 190mm wood shavings between floor joists.
Doors:	3 @ wood with wood storm doors, 1 of which opens to enclosed porch.
Windows:	21.5 sq.m glazed, all DG single-hung, fixed types with wood or alum. storms.
Air change:	0.43 ac/h natural, fresh air intake to return air duct, no exhaust fans.
Heating equipment:	conventional gas furnace, approx. 20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 23 C, 56 h/wk @ 21 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low, dryer vented indoors.
Remarks:	much of house unused; temperatures significantly lower on 2nd, 3rd levels. existing house in amazingly good condition.

ENERGY RETROFIT

Initial Proposal:	minor seal, caulk, weatherstrip doors and windows, by homeowner. replace many windows and 2 doors. insulate exterior walls, basement, attic areas to recommended levels. ventilate attics; modify ductwork to improve heat distribution.
Audit Findings:	new owner plans major modernization including windows, doors, new siding. air sealing, basement and attic upgrading reasonable: suggested to leave bottom 0.3m of basement uninsulated to allow some heat loss to prevent foundation freeze-thaw problems. homeowner proposes to use rigid isocyanurate board in two areas of basement where existing configuration limits space, otherwise glass fibre batts. suggested to upgrade rear addition floor insulation for comfort of long-time occupant (easy to add RSI 3.5), and to replace furnace with high-efficiency (approx. 0.90) type.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement walls, 36m, RSI 3.5	-	-	$2070	21800	5.8
Attic insulation	-	-	1200	7700	9.6
Reinsulate walls, rear floor, caulk	-	-	2457	30800	4.9
Condensing furnace, ductwork	-	-	2795	30800	5.6
Totals	-	-	$8522	72200	7.2

Change in estimated natural air leakage: 32 % reduction from 0.43 to 0.29 ac/h.

NOTES:

C.2.5 Split-level Houses

1945-70:	ED 076	Winnipeg
	ED 083	Winnipeg
	ED 101	Brandon

FILE # ED076

GENERAL DATA

Location:	Winnipeg
Vintage:	1949
Style:	3-level split
Wall type:	wood frame, 54% stucco, 26% rough stone, 20% wood siding
Basement type:	full, concrete
Floor area:	101 square metres on 2 levels above grade, 52 square metres in basement
Interior volume:	382 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	2
Occupancy:	October 1982
Project started:	August 1983
Project completed:	May 1984

PRE-PROJECT HOUSE

Ceilings:	75mm vermiculite between joists on horizontal levels, RSI 1.2 batts on the intervening half wall connecting the two levels.
Main walls:	fibreboard sheathing, 38X89mm framing with RSI 1.2 batts, double drywall.
Basement:	37 square metre level with wood subfloor on 38X89mm sleepers on uninsulated concrete slab-on-grade. deep basement portion: 2.9m total height, 1.3m above grade, full beamfill. 25 square metre portion is panelled along its 13m perimeter and has a wooden floor raised approx. 0.3m above the floor slab. 27 square metre portion is unpanelled along its 11m perimeter. concrete riser wall 6m length is uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG: 2 sealed units in living room and one bedroom, 4 fixed type with wood storms in basement, remaining single-hung type with alum. storms.
Air change:	0.35 ac/h natural, no exhaust fans or fresh air intake.
Heating equipment:	natural gas boiler conversion from oil (October 1982), assumed seasonal efficiency 0.65 (0.60 for the old oil system), exterior chimney.
Domestic hot water:	natural gas (converted from electric in October 1982).
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to medium, no humidifier, dryer vented outdoors.
Remarks:	an unusual design: split level with floor on sleepers on slab, hot water heat; uninsulated and inaccessible hot water lines run between sleepers to the front of the house.

ENERGY RETROFIT

Initial Proposal:	provide TG aluminum windows throughout by replacing some windows entirely and by replacing some inner panes with DG units and retaining storms. insulate deep basement perimeter from interior to RSI 2.1 level. add RSI 7.0 in layered glass fibre batts to ceilings. insulate boiler and hot water pipes.
Audit Findings:	selected air sealing is suggested in problem areas identified. riser wall between two attic sections could be insulated easliy to RSI 7.0. appropriate main basement insulation level would be RSI 3.5. slab-on-grade edge insulation is high priority although only limited results can be obtained because of peculiar ledge construction. cost higher for wood rather than alum. window replacements: poor paybacks.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Basement/slab, 24m/12m, RSI 3.5/2.6	$ 994	$ 0	$ 994	12300	5.0
Attic as above, 95m^2, add RSI 7.0	694	0	694	13700	3.1
Air seal, insul. boiler and pipes	566	0	566	3300	10.7
Totals	$2253	$ 0	$2253	30000	4.6

Change in estimated natural air leakage: 4 % reduction from 0.35 to 0.34 ac/h.

FILE # ED083

GENERAL DATA

Location:	Winnipeg
Vintage:	1961
Style:	4-level split
Wall type:	wood frame, 85% stucco, 15% wood siding
Basement type:	full, concrete
Floor area:	145 square metres on 3 levels above grade, 43 square metres in basement
Interior volume:	484 cubic metres
Heating system:	natural gas, forced air
Occupants:	5
Occupancy:	April 1980
Project started:	September 1983
Project completed:	November 1983

PRE-PROJECT HOUSE

Ceilings:	upper attic: RSI 1.2 batts and blown glass fibre to 50mm over 140mm joists. 47 square metre cathedral ceiling: tongue and groove boards, fibreboard, sheathed with plywood, and shingled, i.e., little thermal resistance.
Main walls:	double drywall, fibreboard sheathing, 38X89mm framing with RSI 1.2 glass fibre batts, except wall adjoining garage with RSI 2.1 batts. floor of upper level portion over garage: 2 layers of RSI 2.1 batts.
Basement:	full beamfill on lowest level, 1.4m above grade, approx. 20m perimeter framed and panelled with RSI 1.4 glass fibre batt insulation. next-to-lowest level: 36 square metre living space and 27 square metre garage on uninsulated concrete slab, approx. 0.2m above grade.
Doors:	2 @ wood with wood storm doors, 1 @ steel, insulated door. 1 @ wood with RSI 1.4 glass fibre batt insulation, opens to unheated garage.
Windows:	all DG sealed and awning units (12mm minimum spacing).
Air change:	0.83 ac/h natural, open fireplace damper (approx. 0.65 ac/h with damper closed), 2 bathroom exhaust fans, no fresh air intake.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney; 1.2 kW electric baseboard heater as supplementary source in basement; occasional use of fireplace with exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 18 C.
Humidity:	low to moderate winter levels, portable humidifiers used.
Remarks:	notable for uninsulated cathedral ceiling, high overall air leakage.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. replace windows with TG units, including reducing living room glazed area. eliminate one entry and install steel, insulated doors in remaining. insulate cathedral ceiling: exterior trusses, new roof, glass fibre batts. modify ductwork to improve heating of lower areas, reroute exhaust fans and install fresh air intake to return air duct.
Audit Findings:	air sealing of all ceilings and cathedral ceiling insulation are priorities. upgrading of upper attic (63 sq. m) insulation to RSI 7.0 level suggested. due to age of furnace, replacement with high-efficiency unit is appropriate (approx. seasonal efficiency 0.90). retrofit project comprising the above, plus operation of fireplace damper closed when not in use, would meet programme energy-saving requirement.

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Cathedral ceiling, 47m^2, RSI 7.0	$2946	$1808	$4754	13100	22.3
Condensing furnace, ductwork	-	-	3000	22600	8.2
Other: air seal, main ceiling	479	0	479	17800	1.6
Totals	-	-	$8233	44800	11.3
Change in estimated natural air leakage: 26 % reduction from 0.83 to 0.62 ac/h.					

FILE # ED101

GENERAL DATA

Location:	Brandon
Vintage:	1964 (est.)
Style:	4-level split
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	94 square metres on 2 above-grade levels, 89 square metres on 2 below-grade levels
Interior volume:	462 cubic metres
Heating system:	natural gas, forced air
Occupants:	4 (plus 1 in July 1983)
Occupancy:	August 1981
Project started:	November 1983
Project completed:	March 1984

PRE-PROJECT HOUSE

Ceilings:	cathedral, horizontal portions insulated with RSI 1.2 batts; soffit vents.
Main walls:	double drywall, 38X89mm framing with RSI 1.2 glass fibre batts.
Basement:	lowest level: full beamfill, 0.5m above grade, 21m perimeter uninsulated. 2nd level concrete: 20m perim. with 38X38mm framing, RSI 1.7 batts, drywall. 2nd level pony wall above concrete: same as main walls.
Doors:	2 @ wood with aluminum storm doors, 1 @ wood with wood storm door.
Windows:	4 DG sealed units (38mm spacing) in basement, 5 TG units incl. DG sealed units (12mm spacing) with aluminum 3rd panes, 9 TG aluminum sliders incl. DG sliders with 3rd storm panes.
Air change:	0.21 ac/h natural, bathroom exhaust fan, no fresh air intake.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary electric heater.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 19 C, 56 h/wk @ 17 C; winter basement temp. approx. 17 C.
Humidity:	winter levels high, window condensation somewhat alleviated by 3rd panes, dryer vented outdoors.
Remarks:	mould growth, attic moisture buildup.

ENERGY RETROFIT

Initial Proposal:	seal, caulk wall outlets, joist areas, attic and cath. ceiling penetrations. replace basement windows with DG box sliders. at 3 entries, replace doors with steel, insulated type and insulated storms. frame and insulate basement concrete wall with RSI 2.1 glass fibre batts. add blown-in loosefill cellulose fibre to horizontal attic to RSI 7.0 level.
Audit Findings:	house is tight: selected air sealing required to prevent moisture problems. older furnace could be replaced by high-efficiency (approx. 0.90) type. new roof is needed: homeowners interested in exterior cathedral ceiling insulation upgrade: suggest adding 38X89mm furring and RSI 3.5 batts which would then total approx. RSI 4.7, spaces would still be vented. basement lowest level to be to RSI 3.5, 2nd level to receive RSI 2.1 on lower part of wall, RSI 3.5 on pony wall (in addition to existing).

Project Components	Costs of Work			Expected Annual Energy Saving (kWh)	Payback Proxy
	Mat'l	Labour	Total		
Air seal, bath. fan, fluor. lighting	$ 322	$ 0	$ 322	1400	16.2
Basement walls, 41m, add RSI 3.5	1708	1150	2858	8400	23.5
Attic upgrade, 46m^2, to RSI 7.0	358	140	498	4600	7.5
Cathedral ceiling as above, 48m^2	1160	800	1960	4900	27.8
Pulse-type furnace, thermostat	-	-	2557	12500	14.2
Totals	-	-	$8195	26300	21.5

Change in estimated natural air leakage: 67 % reduction from 0.21 to 0.07 ac/h.

APPENDIX D

NON-FUNDED RETROFIT PROJECTS

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D.0 NON-FUNDED RETROFIT PROJECTS

D.1 INTRODUCTION

Appendices C and D comprise descriptions of the 154 individual Energy Demo retrofit houses which were examined at least to the energy audit stage, including the projects which were retrofitted under Energy Demo. The series of house files is arranged with the funded group (83) as Appendix C, and with the group of proposed projects (71) which were not carried beyond the energy audit stage as Appendix D.

The organization of house files reflects the two main descriptors of the Manitoba pre-1970 housing stock, i.e., partitioning of Appendix D is according to style and vintage, i.e.:

(a) style: single storey (incl. bungalow, slab-on-grade, bi-level), split-level and 1 1/2, 2 (incl. 1 3/4) and 2 1/2 storey,

(b) vintage: pre-1945, 1945-1970.

The information appearing in each file has been compiled from the following sources:

(a) initial homeowner's Energy Demo project application,

(b) data collected during the energy audit site visit and other visits to the house prior to, during, and following the construction period,

(c) conversations with the homeowner,

(d) retrofit project component evaluation.

Each house file consists of three parts, described below:

FILE # ENERGY DEMO RETROFIT PROJECT

GENERAL DATA

Location:	City, town or municipality.
Vintage:	Known or estimated (est.).
Style:	Split level, bungalow, bi-level, 1 1/2, 1 3/4, 2, 2 1/2 storey.
Wall type:	Structural type (e.g., wood frame, double brick), and exterior finish (e.g., stucco, wood siding).
Basement type:	Style (e.g., full basement, slab, crawlspace), and structural material (e.g., poured concrete, blocks, stone and mortar, pressure-treated wood).
Floor area:	Full height living space only, incl. above grade and basement portions, regardless of level of development.
Interior volume:	Heated living space including basement
Heating system:	Heating fuel (e.g., natural gas, electricity, heating oil, wood, propane, coal), and type of distribution system (e.g., forced air, gravity hot water).
Occupants:	Number of persons normally residing in the house.
Occupancy:	Approximate time when current occupants took up residence.
Project started:	Approval given for construction of retrofit project.
Project completed:	Work completed on retrofit project.

PRE-PROJECT HOUSE

Ceilings: Main walls: Basement: Doors: Windows:	Description of various subcomponents of the building envelope including structural materials and style, insulation materials and amounts.

Air change:	Estimated average natural infiltration rate for period mid-September to mid-May, determined according to method of Shaw (using hourly weather data and airtightness test data [draft CGSB procedure]), and forced or induced additional ventilation equipment.
Heating equipment:	Main space heating appliance and supplementary space heating equipment, assumed seasonal performance, location of chimney for combustion equipment.
Domestic hot water:	Fuel used (e.g., natural gas, electricity).
Temp. settings:	As reported by occupants and/or as assumed in analysis.
Humidity:	Reported or observed levels, status of possible sources (e.g., clothes dryer, humidifier).

ENERGY RETROFIT

Initial Proposal:	Items appearing in the Energy Demo application form initially submitted, i.e., reflecting preferences and perceptions prior to energy audit process.
Audit Findings:	Description of retrofit project components, deletions and revisions suggested as a result of energy audit site visit, proposal assessment, discussion with homeowners, etc.

NOTES:

D.2 NON-FUNDED RETROFIT PROJECTS

D.2.1 1 Storey Houses

Pre-1945:	ED 010	Winnipeg
	ED 241	Winnipeg
1945-70:	ED 033	Winnipeg
	ED 034	Winnipeg
	ED 037	Petersfield
	ED 042	Rosser
	ED 046	Stony Mountain
	ED 049	Winnipeg
	ED 054	Winnipeg
	ED 056	Pinawa
	ED 059	Morden
	ED 068	Winnipeg
	ED 071	Neepawa
	ED 080	Winnipeg
	ED 086	Boissevain
	ED 087	Dunrea
	ED 091	Winnipeg
	ED 107	Ethelbert
	ED 118	Steinbach
	ED 124	Winnipeg
	ED 141	Winnipeg
	ED 154	Thompson
	ED 171	Thompson
	ED 176	Lowe Farm
	ED 185	Thompson
	ED 186	Steinbach
	ED 198	Winnipeg
	ED 207	Thompson
	ED 214	Beausejour
	ED 215	Winnipeg

FILE # ED010

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	89 square metres above grade, 85 square metres in basement
Interior volume:	431 cubic metres
Heating system:	natural gas supplemented with wood, forced air
Occupants:	2
Occupancy:	5 years or longer
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	25mm vermiculite plus 250-300mm blown cellulose, adequately vented.
Main walls:	sheathed both sides, UFFI in cavities, possibly with wood shavings.
Basement:	header insulated, basement 1.0m above grade. walls insulated and panelled, 38X89mm uninsulated stud wall next to concrete with 50/100mm (65%/35% of perimeter) rigid expanded polystyrene.
Doors:	1 @ two wood doors opening to sheltered front porch. 1 @ wood with aluminum storm door.
Windows:	mostly DG (single-hung plus wood storms), one TG picture window with 12mm spacings in living room, one TG awning type with 6mm spacings in kitchen.
Air change:	0.28 ac/h natural.
Heating equipment:	older gas furnace in good condition, assumed seasonal efficiency 0.65, interior chimney; wood stove with exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	assumed normal 21 C setting, some fluctuation likely, see remarks.
Humidity:	winter levels low, both occupants employed outside the home.
Remarks:	until 1982-83 heating season, homeowners used wood almost exclusively (1982 natural gas consumption figures show scarcely any consumption other than for furnace pilot and DHW heater); interior temperatures likely fluctuated due to house being unoccupied for large portions of the day; decision has been made to reduce use of wood because of labour required.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip window frames, basement header areas and entrance ways. replace old bedroom, bathroom, dining room windows with TG units. remove UFFI from main walls, replace with RSI 2.1 glass fibre plus 25mm foil-faced rigid isocyanurate insulating sheathing, restucco. replace furnace with condensing, pulse-type. install insulating exterior shutters on 2 north-facing windows (these would contribute some privacy and noise reduction from major arterial on this side of house.
Audit Findings:	home already well-renovated with relatively low energy consumption (partly due to its small size). energy savings to be gained from proposed retrofit components are insufficient to meet programme requirement or to justify cost.

FILE # ED241

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	71 square metres above grade, 68 square metres in basement
Interior volume:	322 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	May 1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings between joists plus RSI 2.1 glass fibre batts.
Main walls:	shiplap sheathing both sides, 100mm cavities filled with wood shavings with approx. 150mm settlement.
Basement:	partial beamfill, 1.1m above grade, header uninsulated. 35m perimeter: uninsulated.
Doors:	1 @ wood opening to enclosed porch. 1 @ wood with wood storm door.
Windows:	all DG single-hung or fixed types with wood storms, except one new DG awning unit, and one DG sashless slider in bathroom.
Air change:	0.69 ac/h natural, one passive bathroom vent, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace 15-20 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 C all the time; winter basement temp. approx. 10 C.
Humidity:	winter levels low to medium, humidifier used.
Remarks:	house shows its age but is suitable for energy conservation upgrade.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by homeowner. replace all old windows with TG units. replace doors and frames with steel, insulated type and one new alum. storm. insulate basement from interior with RSI 3.5 glass fibre batts, drywall. at less cost install insulating blinds on windows instead of replacing them.
Audit Findings:	attic insulation upgrade to RSI 7.0 level from existing RSI 4.1 is advised. attic, basement, air seal together make a reasonable project, but window and door proposals detrimental to cost effectiveness. homeowners unable to arrange funding for the project.

FILE # ED033

GENERAL DATA

Location:	Winnipeg
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, 83% stucco, 17% cedar siding
Basement type:	full, concrete
Floor area:	90 square metres above grade, 85 square metres in basement
Interior volume:	419 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	July 1959
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	90mm wood shavings plus 75mm zonolite plus RSI 5.64 blown glass fibre.
Main walls:	RSI 1.2 glass fibre in conventional 89mm stud cavities.
Basement:	full beamfill, header areas insulated with RSI 1.4 glass fibre batts. 0.6m above grade; 38.5m perimeter: 30.4m studded full depth and insulated with RSI 1.4 glass fibre batts, 8.2m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	3 bedrooms and bathroom DG plus 3rd polyethylene inner glazing, remainder are TG units.
Air change:	0.36 ac/h natural.
Heating equipment:	two-year-old conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 22 C, 56 h/wk @ 17 C.
Humidity:	medium winter levels, humidifier used, dryer vented indoors, fresh air intake to return air duct, some frosting of exterior wall plugs.
Remarks:	standard bungalow in good condition.

ENERGY RETROFIT

Initial Proposal:	add 38X89mm exterior framing and at least RSI 3.5, then apply aluminum siding. possibly replace remaining DG windows with TG.
Audit Findings:	exterior of home in good condition; replacement not warranted. energy savings to be achieved would not meet programme requirements for cost effectiveness or energy conservation.

FILE # ED034

GENERAL DATA

Location:	Winnipeg
Vintage:	1960 (est.)
Style:	bungalow
Wall type:	wood frame, 82% stucco, 18% hardboard siding
Basement type:	full, concrete
Floor area:	90 square metres above grade, 85 square metres in basement
Interior volume:	427 cubic metres
Heating system:	natural gas, forced air
Occupants:	3 or 4
Occupancy:	likely greater than 10 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	140mm joists with original wood shavings and wood wool to joist tops plus approx. 900mm of wood wool over top.
Main walls:	89mm framing with RSI 1.2 glass fibre batts.
Basement:	full beamfill, header areas insulated with RSI 1.4 glass fibre batts. 0.6m above grade; 40m perimeter: 19m studded full depth with RSI 2.1 glass fibre batts and panelling, 2m insulated full depth with 38mm rigid extruded polystyrene, 19m insulated to 0.8m below grade with 38mm rigid extruded polystyrene. all 4 basement windows DG and blocked off with RSI 2.1 glass fibre batts between outer pane and screen.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door.
Windows:	all TG metal sliders with 50mm spacings except for living room picture window with 12mm spacings.
Air change:	0.14 ac/h natural, fresh air intake to return air duct and 2 speed fan operated continuously.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	91 h/wk @ 21 C, 77 h/wk @ 18 C as of 1983, no setback prior to this.
Humidity:	medium to high in winter, dehumidifier used, some moisture at base of living room picture window, sometimes frost forms at baseboards.
Remarks:	excellent condition, already low energy consumption.

ENERGY RETROFIT

Initial Proposal:	replace entrance doors with steel, insulated type. strip stucco from exterior walls, apply 50mm rigid extruded polystyrene insulating sheathing from soffit area to grade, apply vinyl or aluminum siding. replace furnace with vent damper/spark ignition, energy-efficient type.
Audit Findings:	exterior finish and doors in excellent condition, replacement not warranted. already low energy consumption for house of this type: proposed measures have expected simple payback periods in excess of 20 years. insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED037

GENERAL DATA

Location:	Petersfield
Vintage:	1960-70
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	crawl space, spread footing and pads on grade, block walls.
Heating system:	electric, forced air (supplementary wood heating system)
Project started:	-
Project completed:	-

PRE-PROJEC. HOUSE

Remarks:

ENERGY RETROFIT

Initial Proposal:
replace windows with TG units.
replace 2 wood doors with steel, insulated type; eliminate 1 other door; construct airlock type entrance.
sheet exterior walls with rigid insulation and apply new siding; upgrade exterior wall insulation on interior and apply new drywall.
sheet and side exterior of crawl space walls.
install vapour barrier and additional RSI 3.5 glass fibre batts in attic.
alter ductwork, relocate furnace, install setback thermostat.

Audit Findings:
work proposed for funding under the programme already well underway at time of energy audit site visit, and energy-related components are being funded under another programme, thus rendering application ineligible for consideration.

FILE # ED042

GENERAL DATA

Location:	Rosser
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, 16% wood siding, 84% stucco
Basement type:	full, concrete
Floor area:	94 square metres above grade, 89 square metres in basement
Interior volume:	448 cubic metres
Heating system:	oil, forced air
Occupants:	2
Occupancy:	November 1973
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	50mm vermiculite plus 1 layer of RSI 3.5 glass fibre batts.
Main walls:	plywood sheathing and 38X89mm framing: 19m of perimeter with approx. RSI 1.2 batts, 21m of perimeter with RSI 1.2 batts and UFFI.
Basement:	full beamfill, 1.1m above grade. 39m perimeter: 16m with 38X89mm framing and panelling with RSI 2.1 glass fibre batts, 11m with 38X89mm framing and panelling and empty cavities, 12m uninsulated.
Doors:	1 @ solid core wood door, 1 @ hollow core wood door, both with aluminum storm doors.
Windows:	1 DG sealed unit in living room, remainder are DG single-hung types with wood storms, many frames showing signs of rot.
Air change:	0.23 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	orig. oil furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary 1.5 kW electric heater in basement.
Domestic hot water:	electric.
Temp. settings:	119 h/wk @ 21 C, 49 h/wk @ 19 C; winter basement temp. approx. 119 h/wk @ 20 C, 49 h/wk @ 18 C.
Humidity:	winter levels low to medium, humidifier used, some window condensation on single-hung units.
Remarks:	with off-oil conversion, house has potential to meet programme requirements.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows, doors, baseboards, electrical outlets. replace 5 north-side windows with TG units. frame and insulate basement walls to RSI 3.5 level. seal ceiling penetrations and aud RSI 3.5 glass fibre batts to attic. convert from oil to electric forced-air heating system. install a groundwater source heat pump.
Audit Findings:	selected air sealing work, attic and basement insulation, and off-oil conversion would constitute a reasonable retrofit package which would satisfy programme requirements. priorities of homeowners changed, so that only a less extensive project than the above would be acceptable at this time with insufficient scope to meet programme requirements.

FILE # ED046

GENERAL DATA

Location:	Stony Mountain
Vintage:	1962
Style:	bi-level (split-entry) on slope
Wall type:	wood frame, wood siding one side, remainder stucco
Basement type:	full, concrete
Floor area:	85 square metres above grade, 79 square metres in basement
Interior volume:	386 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	125 mm wood shavings, soffit vents.
Main walls:	38X89mm framing with approx. RSI 1.2 batts, double drywall.
Basement:	full beamfill, 0.3m above grade on east side, 2.0m above grade on west side. 37m perimeter: 19m drywalled with 38X64mm framing and RSI 1.4 glass fibre batts including header area, 10m panelled with 25mm rigid expanded polystyrene including header area, 8m uninsulated except 25mm rigid expanded polystyrene in header area.
Doors:	2 @ wood with wood storm doors.
Windows:	living room DG 3-lite sealed unit, remainder DG aluminum sliders.
Air change:	0.17 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil), assumed seasonal efficiency 0.65, exterior chimney; fireplace with exterior chimney: some backdraughting in spring and fall.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 19.5 C.
Humidity:	winter levels moderate, dryer vented indoors, no humidifier, minimal window condensation.
Remarks:	newer house in excellent condition.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip selected problem areas. insulate remaining 8m of basement wall with 25mm expanded polystyrene and cover with plywood panelling. upgrade attic insulation to RSI 7.0 with blown-in loosefill cellulose fibre. replace furnace with high-efficiency (approx. 0.90) condensing type.
Audit Findings:	selected air sealing is appropriate but fresh air intake is advisable to control humidity if already tight house is made any tighter. with all of the proposed components, retrofit project expected to meet programme requirement for energy savings with expected simple payback period of approx. 12 years. homeowners lost interest in the programme.

FILE # ED049

GENERAL DATA

Location:	Winnipeg
Vintage:	1950-55 (est.)
Style:	bungalow
Wall type:	wood frame, 74% stucco, 26% cedar siding
Basement type:	full, concrete
Floor area:	115 square metres above grade, 108 square metres in basement
Interior volume:	544 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	November 1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	200mm blown cellulose fibre.
Main walls:	89mm cavities filled with original batts and UFFI.
Basement:	full beamfill, 0.6m above grade. 45m perimeter: all but 1.5m studded full depth, insulated with RSI 2.1 glass fibre batts, and panelled.
Doors:	2 @ wood with aluminum storm doors.
Windows:	DG (single plus storm) in living room, dining room, and bathroom, remainder are DG metal sliders with 50mm spacing, except one window with glass blocks.
Air change:	0.11 ac/h natural
Heating equipment:	conventional gas furnace, also natural gas swimming pool heater, fireplace rarely used.
Domestic hot water:	natural gas.
Temp. settings:	approx. 17 C average, with setbacks during the day and at night; winter basement temp. approx. 15 C.
Humidity:	medium because of airtightness of house.
Remarks:	well-insulated bungalow.

ENERGY RETROFIT

Initial Proposal:	strip stucco and siding and contents of wall cavities, fur out studs, install RSI 3.5 glass fibre batts, restucco except cedar siding facing street. replace living room, dining room, bathroom, 3 basement windows with TG, add third pane to remainder, seal and caulk. add a further RSI 1.8 blown cellulose fibre to attic. other: insulate water lines, fresh air intake to return air duct, setback thermostat.
Audit Findings:	all components except attic upgrade have expected simple payback periods well in excess of 20 years. little opportunity for energy savings at reasonable cost: existing structure is relatively well insulated.

FILE # ED054

GENERAL DATA

Location:	Winnipeg
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, 60% stucco, 18% wood siding, 14% brick
Basement type:	full, concrete
Floor area:	104 square metres above grade, 101 square metres in basement
Interior volume:	499 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	June 1982
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	original wood shavings plus RSI 5.6 in glass fibre batts to RSI 7.0 total (late 1982).
Main walls:	assumed RSI 1.2 glass fibre batts in 89mm cavities.
Basement:	full beamfill, 0.8m above grade. 42m perimeter: 18m with 38X89mm framing and panelling but full depth uninsulated, remaining 24m uninsulated full depth.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door.
Windows:	all DG metal sliders, except DG sealed units (6mm spacing) in living room and dining room.
Air change:	0.31 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, probably original, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 C all the time; approx. winter basement temp. 17 C.
Humidity:	low winter levels, humidifier used, dryer vented outside.
Remarks:	typical modern bungalow in excellent condition.

ENERGY RETROFIT

Initial Proposal:	caulk windows and weatherstrip one door. replace all windows with TG aluminum sliders, incl. basement windows. replace two doors with steel, insulated type. insulate all basement walls from interior using RSI 2.1 glass fibre batts.
Audit Findings:	air leakage sealing of entire house apply RSI 2.1 insulation to already-framed portion of basement and finish uninsulated portion to RSI 3.5. due to age of furnace, suggest replacement with high-efficiency type. windows in good condition, suggest adding interior tighter third pane, but this is low priority; door and window replacement not cost effective. air seal/basement/furnace combination would meet programme requirement for energy saving with marginal cost effectiveness, however proposed work became low priority with homeowners.

FILE # ED056

GENERAL DATA

Location:	Pinawa
Vintage:	1963-64
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	91 square metres above grade, 82 square metres in basement
Interior volume:	419 cubic metres
Heating system:	electric, forced air
Occupants:	4
Occupancy:	1972
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	89mm wood shavings plus 3 layers glass fibre batts, i.e., RSI 2.1, 2.1, 3.5.
Main walls:	38X89mm cavities filled with glass fibre batts and UFFI.
Basement:	partial beamfill, 0.8m above grade, headers insulated with RSI 2.1 batts. 32m perimeter: 15m with 50mm expanded polystyrene to 0.6m below grade and framed with RSI 2.1 batts last 1.0m to floor slab, 12m full depth with 50mm expanded polystyrene, 3m with 25mm expanded polystyrene full depth, 2m uninsulated, all insulated areas panelled.
Doors:	2 @ wood doors with aluminum storm doors.
Windows:	all DG aluminum sliders except sealed unit in living room, basement windows with third glazing in winter.
Air change:	0.17 ac/h natural, kitchen and bathroom exhaust fans, no fresh air intake to return air duct.
Heating equipment:	electric furnace 2-2½ years old, chimney unused since off-oil conversion.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 16 C.
Humidity:	winter levels medium, moist basement with historical mould growth, dryer vented outdoors.
Remarks:	newer home not in need of upgrading and already with low energy consumption due to previous upgrading of insulation levels.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house, remove chimney. 4 interior magnetic storm panes for DG alum. sliders. replace wood doors with insulated, steel type. double-wall retrofit incl. remove UFFI, adding curtain wall with glass fibre batts to total RSI 6.3. insulate 1.2m of exterior concrete wall using 50mm extruded polystyrene. add RSI 3.5 batts to ceiling, seal hatch, and add vents. central exhaust system with heat recovery (air-to-air heat exchanger). fluorescent lighting; add insulation to DHW tank and reduce temp. setting, add preheat tank.
Audit Findings:	home in excellent condition with low existing energy demand: minimum energy-saving requirement of the programme cannot be achieved with any combination of the proposed components or any other practical measures. a project to remove UFFI from walls would present an opportunity to upgrade wall thermal resistance, but wall retrofit cannot be justified on the basis of energy savings alone (slightly greater than 20% reduction in annual home energy consumption, with expected simple payback period of approximately 35 years).

FILE # ED059

GENERAL DATA

Location:	Morden
Vintage:	1950-55 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	106 square metres above grade, 95 square metres in basement
Interior volume:	484 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	September 1972
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	180mm wood shavings plus 1 layer (circa autumn 1982) of RSI 3.5 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, header areas not insulated on interior. 42m perimeter with 38X89mm framing and RSI 2.1 glass fibre batts on the interior; additional 38mm rigid extruded polystyrene board on approx. 50% of exterior above grade.
Doors:	2 @ wood with wood storm doors.
Windows:	TG bedroom windows (autumn 1982), remainder are DG, basement windows covered on exterior with rigid extruded polystyrene board.
Air change:	0.30 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 16 C.
Humidity:	winter levels high, dryer vented outdoors, winter window condensation.
Remarks:	house in good condition, upgraded insulation levels already in some areas.

ENERGY RETROFIT

Initial Proposal:	seal, caulk areas of high infiltration with urethane foam, including in electrical boxes, baseboards, and joist areas. replace living room and kitchen windows with TG units. replace wood doors, storms with steel, insulated type, aluminum storms. strip stucco, resheet exterior walls with 38mm rigid extruded polystyrene board and vinyl or aluminum siding. replace furnace with high-efficiency (approx. 0.90) pulse type.
Audit Findings:	only air sealing and furnace replacement components are reasonably cost effective (not far beyond 10 year expected simple payback periods), but together are insufficient to reduce total annual energy consumption enough to meet 40% requirement of programme. remaining proposed components not appropriate measures to implement at this time on the basis of energy conservation. homeowner warned about danger of spraying foam sealant into electrical boxes.

FILE # ED068

GENERAL DATA

Location:	Winnipeg
Vintage:	1950-60 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	73 square metres above grade, 69 square metres in basement
Interior volume:	342 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1977
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	wood shavings to top of 140mm joists, RSI 3.5 glass fibre batts over top.
Main walls:	89mm framing, likely RSI 1.2 batts.
Basement:	full beamfill, 0.75m above grade. 33m perimeter insulated full height and panelled: 12m strapped with 38mm glass fibre batts, 16m studded with RSI 2.1 glass fibre batts, 5m with 38mm expanded polystyrene.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG metal sliders, except DG living room picture window with 12mm spacing and single-plus-storm type basement windows.
Air change:	0.27 ac/h natural, kitchen exhaust fan.
Heating equipment:	conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	22 C all the time.
Humidity:	low winter levels, dryer vented outside, humidifier present but unused.
Remarks:	small house with low total energy consumption.

ENERGY RETROFIT

Initial Proposal:	recaulk and weatherstrip windows and doors. double-wall retrofit: 38X89mm framing with 2 layers of RSI 2.1 to 0.3m below grade, including closing off two unneeded windows.
Audit Findings:	proposed cost of wall retrofit, which requires extension of roof lines to accommodate additional wall thickness (existing structure has no overhangs), leads to unacceptable expected simple payback period for energy savings. house relatively well insulated, therefore insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED071

GENERAL DATA

Location:	Neepawa
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete block
Floor area:	64 square metres above grade, 59 square metres in basement
Interior volume:	269 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	January 1978
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	75mm loosefill cellulose fibre covered with 2 layers of RSI 3.5 glass fibre batts, 2 gable-end and 1 wind-powered vent.
Main walls:	shiplap sheathing and 38X89mm framing with RSI 1.2 glass fibre batts.
Basement:	0.8m above grade, walls with 38X38mm framing and panelling, insulated with glass fibre batts (approx. RSI 0.7).
Doors:	2 @ wood with wood storm doors.
Windows:	2 DG sealed units in living room, remainder are 5 TG and 5 DG units of varying types, and 3 DG basement windows covered with 50mm extruded polystyrene.
Air change:	0.14 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, 22 years old, assumed seasonal efficiency 0.65, exterior chimney; supplementary wood-fired space heater not yet in use.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 18 C, 56 h/wk @ 21 C; winter basement temp. approx. 18 C.
Humidity:	winter levels moderate, minimal window condensation, dryer vented outdoors.
Remarks:	newer home not in need of upgrading.

ENERGY RETROFIT

Initial Proposal:	seal, weatherstrip attic door. add interior storm 3rd pane to DG living room window. construct storm entry at rear door. sheath exterior walls with 38mm rigid extruded polystyrene and apply stucco. apply 38mm rigid extruded polystyrene to exterior of foundation wall above grade and parge. ventilation system with heat recovery (air-to-air heat exchanger).
Audit Findings:	low energy demand already. age of existing furnace would support its replacement with higher-efficiency unit. with air seal, wall and basement exterior retrofit, and furnace replacement, programme requirement for energy saving can be met, but expected simple payback period would be over 30 years, which is unacceptable.

FILE # ED080

GENERAL DATA

Location:	Winnipeg
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, 68% stucco, 32% wood siding and brick
Basement type:	full, concrete
Floor area:	80 square metres above grade, 76 square metres in basement
Interior volume:	381 cubic metres
Heating system:	natural gas supplemented with wood, forced air
Occupants:	4
Occupancy:	1969
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings plus 2 layers of RSI 2.1 glass fibre batts (fall 1982).
Main walls:	38X89mm framing with RSI 2.1 glass fibre batts.
Basement:	full beamfill, 0.6m above grade. 36m perimeter: 11m framed and insulated full depth to RSI 1.2 with glass fibre batts, 18m has 76mm expanded polystyrene board next to wall full depth plus 51mm glass fibre with 38X38mm framing, and 7m is uninsulated.
Doors:	2 @ steel, insulated doors (1982) with wood storm doors.
Windows:	all DG sashless slider type except sealed DG living room window (12mm spacing).
Air change:	0.24 ac/h natural, kitchen exhaust fan, fresh air intake stuffed with glass fibre batt.
Heating equipment:	conventional gas furnace approx. 15 years old, assumed seasonal efficiency 0.65, interior chimney. wood stove in use (approx. 3 cords/year), heat distributed partially via return air register located near stove, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 22 C, 56 h/wk @ 20 on main floor; winter basement temp. approx. 26 C during the day, 22 C during the night.
Humidity:	winter levels medium, humidifier not used.
Remarks:	typical newer bungalow with some previous upgrading.

ENERGY RETROFIT

Initial Proposal:	seal, caulk around windows, doors, ceiling fixtures, weatherstrip attic hatch. replace all sliding windows with TG fixed/awning type. replace loosely fitting wood storm doors with aluminum storm doors. double wall exterior retrofit incl. RSI 5.6 glass fibre batts, 38X89mm framing, aluminum siding. add 1 further layer of RSI 2.1 glass fibre batts to ceiling.
Audit Findings:	all proposed components have expected simple payback periods of 20 years or longer except air leakage sealing. insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED086

GENERAL DATA

Location:	Boissevain
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete block
Floor area:	112 square metres above grade, 107 square metres in basement
Interior volume:	497 cubic metres
Heating system:	oil, forced air
Occupants:	3
Occupancy:	likely 1961
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	approx. 89mm vermiculite covered with 38mm loosefill cellulose fibre.
Main walls:	38X89mm framing insulated with RSI 1.2 glass fibre batts.
Basement:	1.0m above grade, header areas uninsulated. 43m perimeter: 7m with 38mm rigid extruded polystyrene board full depth, 14m with 38X89mm framed but uninsulated wall and panelling, 22m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG slider type, except 2 DG sealed units in living/dining room, 2 SG units in basement.
Air change:	0.13 ac/h natural, kitchen exhaust fan vented through wall, no fresh air intake to return air duct.
Heating equipment:	original oil furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 16 C; winter basement temp. approx. 16 C.
Humidity:	winter levels moderate, historical mould growth in basement, insulation placed at bottom of glazed areas in winter to prevent condensation.
Remarks:	newer home with significant potential for upgrading basement and ceiling insulation levels and for off-oil conversion.

ENERGY RETROFIT

Initial Proposal:	caulk doors and windows. replace 6 DG windows incl. living room sealed unit with 5 TG awning units and 1 combination TG fixed/casement unit. sheet exterior walls with 38mm rigid extruded polystyrene board and cover with vinyl siding. insulate basement and attic..
Audit Findings:	main wall retrofit would save less than 10% annual energy consumption with greater than 20 year expected simple payback as proposed. house very tight, therefore sealing of specific upper envelope areas is important. remove basement wall panelling and install RSI 2.1 glass fibre batts in uninsulated wall cavities, replace panelling; frame, panel, and insulated previously bare wall section with RSI 2.1 glass fibre batts. add 150mm loosefill cellulose fibre to ceiling. homeowner not in favour of suggested off-oil conversion, preferring wall and window retrofits as major priorities. without fuel conversion, programme requirement for reduction in energy consumption would not be met at reasonable cost.

FILE # ED087

GENERAL DATA

Location:	Dunrea
Vintage:	1961
Style:	bungalow
Wall type:	wood frame, aluminum siding
Basement type:	full, concrete
Floor area:	145 square metres above grade, 115 square metres in basement
Interior volume:	601 cubic metres
Heating system:	electric, baseboard
Occupants:	6
Occupancy:	December 1973
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main ceiling over house: RSI 3.5 glass fibre batts between 89mm joists, all covered with 100mm loosefill cellulose fibre. near garage: horizontal and sloped areas insulated with RSI 2.1 glass fibre batts.
Main walls:	13mm backerboard on siding, shiplap, 38X89mm framing with RSI 1.2 glass fibre batts.
Basement:	partial beamfill, 1.0m above grade, header areas insulated with RSI 2.1 glass fibre batts. 42m perimeter: 13m framed, panelled to 0.7m below grade, insulated with RSI 1.4 glass fibre batts, 29m uninsulated.
Doors:	1 @ wood with aluminum storm door plus 1 wood door opening to garage.
Windows:	all DG aluminum sliders except DG sealed in living/dining room.
Air change:	0.11 ac/h natural, kitchen exhaust fan, no fresh air intake to return air duct.
Heating equipment:	electric baseboard heaters; supplementary wood heat via fireplace in basement, interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 15 C.
Humidity:	moderate to high winter levels, dehumidifier used, history of mould growth in corners, windows frost up completely, kitchen exhaust fan damper freezes open, frost on exterior wall outlets, clothes hung indoors.
Remarks:	very high humidity levels in this tight house.

ENERGY RETROFIT

Initial Proposal:	seal, weatherstrip doors, windows. replace all windows with TG casement and awning types. replace one door with insulated, steel type. insulate remaining portion of basement wall with RSI 2.1 glass fibre batts. central exhaust system for kitchen and bathroom to reduce humidity. add 38mm rigid extruded polystyrene board and cover to bottom of garage ceiling.
Audit Findings:	window and door replacement dominates proposal, resulting in extremely poor cost effectiveness with respect to energy savings. basement insulation and air sealing, on the other hand, lead to expected simple payback periods of approx. 5 years as proposed, but with total energy savings of less than 20%, insufficient to meet programme requirement. little opportunity for major reduction in energy demand in this house.

FILE # ED091

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	78 square metres above grade, 74 square metres in basement
Interior volume:	366 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	late 1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	75-100mm wood shavings between 140mm joists, all covered by one layer of RSI 3.5 glass fibre batts.
Main walls:	assumed approx. RSI 1.2 batts.
Basement:	full beamfill, 1.0m above grade. 35m perimeter: 17.5m of header areas insulated with RSI 2.1 glass fibre batts, 17.5m uninsulated. 11m of perimeter finished with 38X89mm framing and RSI 2.1 glass fibre batts and drywall; 24m finished with 38X89mm framing and RSI 1.4 glass fibre batts and plywood panelling. 15 square metres of floor slab insulated with approx. 25mm rigid glass fibre covered with carpet (bedroom in one corner of basement).
Doors:	1 @ wood with wood storm door. 1 @ steel, insulated door with aluminum storm (faces south).
Windows:	all DG metal vertical or horizontal sliders, except DG sealed (narrow spacing) picture window in living room, and 3rd polyethylene glazing on DG metal sliders in the two main floor bedrooms.
Air change:	0.40 ac/h natural, bathroom exhaust fan, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, approx. 20 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 20 C all the time: winter basement temp. approx. 19 C.
Humidity:	winter levels low, dryer vented inside, humidifier not operational.
Remarks:	occupants have attended to drafty areas with application of polyethylene and door replacement, completed the basement insulation; small house which consumes relatively little energy for space heating.

ENERGY RETROFIT

Initial Proposal:	replace 5 windows and one door. insulate main walls with 50mm extruded polystyrene, cover with vinyl siding. upgrade insulation on basement walls to RSI 2.1 where it has not yet been done.
Audit Findings:	cost estimates provided with proposal just major materials plus a very low estimate of labour cost. only minor energy saving to be achieved by basement upgrade proposal: RSI 3.5 level suggested, if work to be undertaken. possible to upgrade attic insulation further. significant alteration to roof lines likely required for any exterior wall retrofit because of width of added assembly (no overhangs). house relatively well insulated already, therefore insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED107

GENERAL DATA

Location:	Ethelbert
Vintage:	1968
Style:	bungalow
Wall type:	wood frame, approx. 60% stucco and 40% wood siding
Basement type:	full, concrete block
Floor area:	89 square metres above grade, 84 square metres in basement
Interior volume:	445 cubic metres
Heating system:	propane, forced air
Occupants:	2
Occupancy:	likely 1968
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	horizontal and cathedral portions: 1 layer of RSI 3.5 glass fibre batts, both soffit and ridge vents.
Main walls:	shiplap both sides, 38X89mm framing, RSI 2.1 glass fibre batts.
Basement:	0.8m above grade, header areas uninsulated, top 0.4m of block wall core is filled with vermiculite. 38m perimeter uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG wood, some sealed units in living room and dining room, sliders elsewhere.
Air change:	0.14 ac/h natural, fresh air intake to return air duct, no exhaust fans.
Heating equipment:	original (1968) conventional draft propane furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	propane.
Temp. settings:	168 h/wk @ 19 C; winter basement temp. approx. 16 C.
Humidity:	low to moderate winter levels, portable humidifiers used, dryer vented outdoors.
Remarks:	newer house in excellent condition, yet with significant potential for implementation of energy conservation measures.

ENERGY RETROFIT

Initial Proposal:	caulk around sealed window units, weatherstrip doors. add third pane to 8 DG windows, 4 basement windows. wall retrofit from interior, adding RSI 4.2 glass fibre insulation. frame and insulate basement walls on interior to RSI 3.5 level. upgrade attic insulation by blowing in 140mm loosefill cellulose fibre in horizontal ceiling area. replace furnace with high-efficiency propane type or convert to electric furnace.
Audit Findings:	with homeowner supplying labour (is a contractor) for envelope upgrading components, proposed work is cost effective and would reduce annual energy consumption by more than 50%. 3rd panes should be on interior of sliders to prevent condensation between glazings. interior wall retrofit would result in significant reduction of living space, but occupants' children have left home and this effect is considered not to be a problem. high-efficiency furnace installation in conjunction with other work would necessitate consideration of ventilation system to control humidity, as house is already tight. existing furnace is far from the end of its useful life; the other components of proposal are higher priorities. homeowners decided not to proceed with retrofit at this time.

FILE # ED118

GENERAL DATA

Location:	Steinbach
Vintage:	1958
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	97 square metres above grade, 77 square metres in basement
Interior volume:	465 cubic metres
Heating system:	oil, forced air
Occupants:	6
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	140mm wood shavings covered with 2 layers of RSI 3.5 glass fibre batts, 2 gable vents.
Main walls:	shiplap both sides, 38X89mm framing with RSI 1.2 batts.
Basement:	full beamfill, 0.8m above grade, header areas insulated with RSI 1.4 batts. 45m perimeter: 30m with 38X89mm framing and RSI 1.4 plus RSI 2.1 glass fibre batts and panelling, 13m with full height 51mm rigid extruded polystyrene board (uncovered), 2m uninsulated.
Doors:	2 @ solid wood doors with wood storm doors, one of which is sealed off and insulated with RSI 3.5 batts during winter.
Windows:	5 fixed and 13 single-hung SG windows, 15 of which have winter 2nd glazing.
Air change:	0.15 ac/h natural, kitchen and bathroom exhaust fans, no fresh air intake to return air duct.
Heating equipment:	original oil furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 17 C; approx. winter basement temp. 17 C.
Humidity:	winter levels considered to be low, but winter condensation and closet mould growth has occurred, dryer vented outdoors.
Remarks:	home has been upgraded previously and has low energy demand.

ENERGY RETROFIT

Initial Proposal:	replace 6 single glazed windows and storms with TG units. replace 2 doors with steel, insulated type. construct greenhouse on south-facing wall to capture solar energy. convert to a wood-burning furnace.
Audit Findings:	greenhouse proposal deferred. oil-to-wood conversion could reduce fuel cost to homeowner but not energy consumption. door and window replacement would save little energy compared to programme requirement. conversion to electric heating from oil would result in significant energy saving and would be cost effective, but still would be insufficient to meet programme requirement for energy saving. all other reasonable energy conservation measures have already been implemented.

FILE # ED124

GENERAL DATA

Location:	Winnipeg
Vintage:	1965
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	95 square metres above grade, 83 square metres in basement
Interior volume:	435 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1965
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	125mm wood shavings between 140mm joists, one-third of area covered with 150mm vermiculite, two-thirds of area with one layer of RSI 2.1 batts.
Main walls:	89mm cavities with RSI 1.4 glass fibre batts.
Basement:	full beamfill, 0.8m above grade, header areas insulated with RSI 3.5 glass fibre batts. 43m perimeter: 38X89mm framing, RSI 3.5 glass fibre batts, panelling or drywall.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG aluminum horizontal sliders except living room with DG wood, fixed type with exterior aluminum 3rd storm pane and DG awning (12mm spacing) in basement.
Air change:	0.15 ac/h natural, kitchen and bathroom exhaust fans, fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 18 C; winter basement temp. approx. 19 C.
Humidity:	winter levels medium, humidifier not used.
Remarks:	excellent condition without much potential for energy savings at reasonable cost.

ENERGY RETROFIT

Initial Proposal:	exterior retrofit of walls: 100mm of foil-faced rigid isocyanurate board, restucco. add RSI 3.5 blown cellulose fibre to attic, increase ventilation.
Audit Findings:	existing house is quite airtight and has low energy consumption. because of existing levels of ceiling insulation, attic upgrade has expected simple payback period of almost 20 years. exterior wall retrofits as proposed or using framing/glass fibre method all have unacceptable payback periods, as does the addition of 3rd panes to existing DG windows. furnace replacement with higher efficiency unit not now cost effective. insufficient potential to meet programme requirement for energy saving at reasonable cost.

FILE # ED141

GENERAL DATA

Location:	Winnipeg
Vintage:	1948
Style:	bungalow
Wall type:	wood frame, 82% stucco, 18% wood siding
Basement type:	full, concrete
Floor area:	65 square metres above grade, 60 square metres in basement
Interior volume:	304 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1978
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings between 89mm joists plus 2 layers of RSI 2.1 glass fibre batts.
Main walls:	89mm cavities filled with blown rock wool or shredded paper.
Basement:	0.8m above grade; header on sill plate, headers insulated with RSI 2.1 glass fibre batts. 31m perimeter framed and insulated full depth with RSI 2.1 glass fibre batts and panelling or drywall finish, except for 2.5m done with 38X38mm strapping and RSI 1.4 batts.
Doors:	2 @ wood with aluminum storm doors.
Windows:	DG fixed wood (narrow spacing) type in living room, 4 small TG aluminum sliders, DG single-hung type with alum. storms in bedrooms and kitchen.
Air change:	0.30 ac/h natural, exhaust fans in 2 bathrooms, no fresh air intake to return air duct, basement fireplace has own air supply.
Heating equipment:	conventional gas furnace, 15-20 years old, assumed seasonal efficiency 0.65, interior chimney; wood stove with exterior chimney is used to a level of approx. 1-2 cords per year.
Domestic hot water:	natural gas.
Temp. settings:	average approx. 20.5 C all the time; winter basement temp. approx. 19 C.
Humidity:	winter levels low to medium, humidifier used.
Remarks:	small bungalow, low energy consumption.

ENERGY RETROFIT

Initial Proposal:	strip stucco and reinsulate wall cavities, esp. if largely shredded paper now, with RSI 2.1 glass fibre batts, sheath with 38mm rigid extruded polystyrene board, restucco; work would include application of air/vapour barrier which would reduce air leakage at header area, currently significant and causing cold main floor perimeter. replace doors and frames with steel, insulated type. replace DG windows on front and back of house with TG units. install lower attic vents to complement existing turbine type on peak (roof would be altered to provide overhangs and soffit vents). other: service and clean heating system, install dimmers and fluorescent lighting in some areas, insulate hot water lines.
Audit Findings:	insufficient potential to meet programme requirement for energy saving at reasonable cost, mainly because of current low space heating load due to size of house and already upgraded attic and basement.

FILE # ED154

GENERAL DATA

Location:	Thompson
Vintage:	1969
Style:	bi-level (split-entry)
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	88 square metres above grade, 82 square metres in basement
Interior volume:	515 cubic metres
Heating system:	propane, forced air
Occupants:	2
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	140mm wood shavings covered with 190mm loosefill cellulose fibre.
Main walls:	38X89mm framing with RSI 1.8 glass fibre batts, drywall.
Basement:	top of foundation 0.3m above grade, 37m perimeter insulated. pressure-treated wood floor above heated crawl space which is 0.7m high from the soil to the subfloor. 1.5m high concrete wall portion of finished basement (1.2m below grade) with 50mm expanded polystyrene board next to concrete and 38X38mm framing with RSI 1.4 glass fibre batts and drywall on interior. 1.2m pony wall from top of concrete to bottom of ceiling joists: 38X89mm framing with RSI 1.8 glass fibre batts, air space, 38X38mm framing with RSI 1.4 glass fibre batts, interior drywall.
Doors:	2 @ wood with wood storm doors.
Windows:	5 DG sashless sliders with exterior 3rd aluminum storm panes and 5 DG sealed units.
Air change:	0.18 ac/h natural, kitchen, 2 bathroom, and sauna exhaust fans, fresh air intake to return air duct.
Heating equipment:	original conventional propane gas furnace, assumed seasonal efficiency 0.65, combination forced air and hot water system, interior chimney; supplementary heating with 2.5kW electric baseboard heater in basement and fireplace with exterior chimney.
Domestic hot water:	propane.
Temp. settings:	130 h/wk @ 18 C, 38 h/wk @ 20 C; winter basement temp. approx. 130 h/wk @ 18 C, 38 h/wk @ 16 C.
Humidity:	winter levels moderate with window condensation occurring (wall stains visible), bedroom windows frost up, upstairs bathroom exhaust fan drips, dryer vented outdoors, no humidifier used.
Remarks:	newer home, well-insulated and airtight; not often occupied in winter.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. interior magnetic-type storm panes on 10 windows. replace doors with steel, insulated type; replace wood storms with aluminum type. replace existing furnace with high-efficiency type.
Audit Findings:	conception of high heating cost due to unit cost of propane and severity of northern climate. air sealing and window and door replacement would not result in much saving of energy, but air sealing in selected areas in the upper envelope area may be advisable to prevent possible moisture related problems within the structure. cost of furnace replacement could be expected to be recovered in approx. 11 years (simple payback), but total energy saving insufficient to meet programme requirement; existing furnace not near end of useful life.

FILE # ED171

GENERAL DATA

Location:	Thompson
Vintage:	1969
Style:	bungalow
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	95 square metres above grade, 88 square metres in basement
Interior volume:	450 cubic metres
Heating system:	propane, forced air
Occupants:	5
Occupancy:	December 1972
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	approx. 90mm wood shavings, 4 soffit and 2 gable vents.
Main walls:	38X89mm framing with RSI 1.8 glass fibre batts.
Basement:	partial beamfill, 0.6m above grade, header areas uninsulated. 38m perimeter: 24m with 38X89mm framing full height, RSI 2.1 batts, panelling, 14m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	7 TG windows including 1 DG sealed unit and 6 vinyl sliders, all with aluminum storms, 4 DG vinyl sliders in basement.
Air change:	0.28 ac/h natural, fresh air intake to return air duct, no exhaust fans.
Heating equipment:	original conventional propane gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 23 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to moderate, humidifier not used, dryer vented outdoors, historical mould growth in basement and window condensation.
Remarks:	newer home in good condition with basic energy conservation potential.

ENERGY RETROFIT

Initial Proposal:	caulk windows, renew weatherstripping on doors. replace 1 bedroom and 4 basement windows with TG units. replace doors with steel, insulated type. sheet exterior walls with 50mm rigid polystyrene and apply vinyl siding. finish insulation of basement perimeter walls from interior. raise attic insulation level to RSI 5.3.
Audit Findings:	appropriate attic insulation level is RSI 7.0: to exceed this level, it is suggested to install 2 layers of RSI 3.5 glass fibre batts over existing shavings. appropriate basement wall insulation level is RSI 3.5. attic and basement insulation and minor air sealing work are cost effective, but door and window replacement is not advised at this time. conversion from propane to electric heating also could be cost effective. minimum energy-saving requirement of the programme would be achieved with the above cost-effective measures. homeowner subsequently lost interest in the programme.

FILE # ED176

GENERAL DATA

Location:	Lowe Farm
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	partial, concrete and concrete block
Floor area:	89 square metres above grade, 31 square metres in basement
Interior volume:	338 cubic metres
Heating system:	electric, forced air
Occupants:	4
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	150mm wood wool under 230mm loosefill cellulose fibre, 5 soffit vents.
Main walls:	38X89mm framing with RSI 1.2 batts.
Basement:	0.7m above grade, headers uninsulated; full depth portion is in one corner with cast-in-place walls below grade; entire perimeter above grade is concrete-block construction; crawl space floor is earthen. 37m perimeter: 11m is full depth, 3m of which is framed and insulated with RSI 3.5 batts for the upper 0.6m of height and RSI 2.1 batts for the lower part to the floor, and 8m of which is uninsulated. remaining 26m of perimeter is 0.6m high uninsulated crawl space wall.
Doors:	1 @ wood with aluminum storm. 1 @ steel, insulated type without storm door.
Windows:	7 DG types including 1 sealed unit and 6 sashless sliders.
Air change:	0.22 ac/h natural, fresh air intake to return air duct, no exhaust fans.
Heating equipment:	electric furnace (1981 vintage), interior chimney sealed off.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 21 C, 56 h/wk @ 20 C; winter basement temp. approx. 16 C.
Humidity:	winter levels high, dryer vented indoors, significant degree of window condensation.
Remarks:	minor foundation shifting experienced; electrical service includes farm usage (welder, 5 kW heater, etc.).

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. replace all slider windows with TG units, add 3rd glazing to sealed living room window. replace 1 door with steel, insulated type. replace wood siding with insulated siding. insulate remaining full-height portion of basement wall and entire crawl space perimeter on the interior with 38mm rigid extruded polystyrene board.
Audit Findings:	very poor expected payback periods for window and door replacements. if house siding to be replaced, suggested to take the opportunity to add exterior insulation to wall: from standpoint of energy saving relative to cost of this work, application of new siding not recommended. exterior application of crawl space insulation could allow an additional exterior skirt of insulation to be included in the work and the result would protect block foundation from influence of severe seasonal variations in climate. air seal and basement insulation are the priorities for energy conservation work in this house. covering of crawl space earthen floor could be beneficial to interior humidity levels. insufficient overall potential to meet programme requirement for energy saving at reasonable cost.

FILE # ED185

GENERAL DATA

Location:	Thompson
Vintage:	1961
Style:	1 storey slab on grade
Wall type:	wood frame, 22% wood siding, 78% stucco
Basement type:	none (slab on grade)
Floor area:	88 square metres above grade
Interior volume:	213 cubic metres
Heating system:	propane, forced air
Occupants:	2
Occupancy:	1961
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	38mm wood wool covered with 1 layer of RSI 3.5 glass fibre batts; soffit vents are blocked, 2 gable vents in operation.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	top of slab 0.4m above grade. 38m perimeter: edge insulated to grade with 50mm rigid foam insulation.
Doors:	2 @ hollow wood doors, with one aluminum and one wood storm door.
Windows:	all TG windows, incl. DG units (10mm spacing) with 3rd storm panes.
Air change:	0.38 ac/h natural, kitchen and bathroom exhaust fans, combustion/fresh air intake with no damper running through roof to vicinity of furnace.
Heating equipment:	orig. conventional propane furnace, assumed seasonal efficiency 0.65, interior chimney; supplementary wood heating with interior chimney (5-6 cords jackpine per year; appears to have cut propane consumption from 10 year average of 54,500 cubic feet per year to approx. 25,000 cubic feet).
Domestic hot water:	propane.
Temp. settings:	168 h/wk @ 21 C.
Humidity:	winter levels low, humidifier used at night, no window condensation, historical mould growth on ceiling in one room, dryer vented outdoors.
Remarks:	newer house with previous energy-conservation upgrading: limited potential for further cost effective work.

ENERGY RETROFIT

Initial Proposal:	replace 2 doors with steel, insulated type. strip stucco, strap exterior walls with 38X89mm framing and install RSI 2.1 glass fibre batts in stud spaces, apply aluminum siding. add 50mm rigid extruded polystyrene board to slab edge.
Audit Findings:	wall retrofit and door replacement unnecessary at this time. selected air leakage sealing suggested, along with conversion to electric forced air heating system or high-efficiency propane, as being cost effective due to unit propane cost: in combination with slab perimeter insulation (including horizontal skirt 0.6m wide where feasible around house), these components would constitute a project meeting programme requirements. homeowner suspicious of electric heating due to moisture problems experienced by acquaintances who converted; with existing fresh air supply system and low moisture production rates by occupants, this would be unlikely to be a problem in this house. contact lost with applicant; project did not proceed.

FILE # ED186

GENERAL DATA

Location:	Steinbach
Vintage:	1963 (est.)
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	88 square metres above grade, 85 square metres in basement
Interior volume:	423 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	May 1982
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	80mm wood shavings plus 150mm loosefill cellulose fibre; 2 gable vents.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	partial beamfill, 0.7m above grade, 38m perimeter uninsulated incl. headers.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG sashless sliders except 3-lite DG sealed unit (12mm spacing) in living room.
Air change:	0.09 ac/h natural, bathroom exhaust fan closed off, no fresh air intake to return air duct.
Heating equipment:	newer conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	168 h/wk @ 20.5 C; winter basement temp. approx. 17 C.
Humidity:	winter levels moderate, some condensation on windows, dryer vented outdoors, no humidifier.
Remarks:	surprisingly tight house considering most windows are sashless type; current occupants have low moisture production and no humidity problems but previous inhabitants may have had problems; paint is peeling badly on exterior.

ENERGY RETROFIT

Initial Proposal:	replace sliders on south side with DG units, north sliders with TG units. replace doors with steel, insulated type. frame and insulate basement to RSI 2.1 level. add 1 layer of RSI 3.5 glass fibre batts to attic. install wood burning furnace to reduce use of natural gas. other: insulate DHW tank and pipes, convert to fluorescent lighting in basement.
Audit Findings:	wood is less efficient as a fuel, although cost can be lower than utility-supplied fuels. window and door components not cost effective, nor does condition warrant replacement. basement insulation to RSI 3.5, addition of approx. RSI 2.0 or more, and upgrading gas furnace to high-efficiency (approx. 0.90) unit would meet programme requirement for total annual energy saving with a somewhat longer than 10 year expected simple payback period. any upgrading would have to be accompanied by consideration for potential moisture problems, as this is already an extremely tight house; selected air sealing, especially on the upper portions of the envelope, would be required, and installation of functional soffit vents and planned ventilation of the interior space also would be advisable. homeowners' preferred retrofit project included a wood furnace which could not be cost-shared within the programme.

FILE # ED198

GENERAL DATA

Location:	Winnipeg
Vintage:	1950-55 (est.)
Style:	bungalow
Wall type:	wood frame, 79% stucco, 21% wood siding
Basement type:	full, concrete
Floor area:	84 square metres above grade, 80 square metres in basement
Interior volume:	394 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	mid-1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	wood shavings and loosefill glass fibre to RSI 5.0.
Main walls:	38X89mm framing with RSI 1.2 batts.
Basement:	full beamfill, 0.7m above grade, header area insulated with 18mm fibreboard. 38m perimeter: 17m with 38X64mm framing, RSI 1.4 glass fibre batts and panelling, 6m insulated with 18mm fibreboard, and 15m is uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all except DG basement windows and sashless DG slider in bathroom are TG: living room and dining room picture windows are 3 single glazed windows mounted in the frame, remainder are DG sashless sliders with interior 3rd pane.
Air change:	0.24 ac/h natural, no fresh air intake to return air duct.
Heating equipment:	oil furnace converted to gas, assumed seasonal efficiency 0.65, exterior chimney; natural gas clothes dryer.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20.5 C, 56 h/wk @ 16 C; approx. winter basement temp. 17 C.
Humidity:	winter levels medium to high, condensation problems alleviated by 3rd panes, humidifier used.
Remarks:	high DHW consumption reported, possible reason for high humidity.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house by contractor. replace DG-plus-3rd-pane windows in kitchen, 2 bedrooms, and DG in bathroom with TG units. replace doors with steel, insulated type. upgrade basement wall insulation to a uniform RSI 4.9 level with 38X89mm framing and glass fibre batts, drywall finish. add a further RSI 5.3 blown loosefill glass fibre to attic, add wind-powered vent and bathroom exhaust fan. possible furnace replacement with higher-efficiency type.
Audit Findings:	only basement insulation proposal has expected simple payback period less than 10 years. attic upgrade is inappropriate in terms of cost effectiveness. basement, attic, and air seal together have expected simple payback period of approx. 15 years. with condensing furnace added to the above package, energy saving is expected to almost meet programme requirement, but payback would approach 20 years. homeowners subsequently decided upon self-funded window replacement; resale planned.

FILE # ED207

GENERAL DATA

Location:	Thompson
Vintage:	1958
Style:	bungalow
Wall type:	wood frame, wood siding
Basement type:	full, concrete
Floor area:	92 square metres above grade, 85 square metres in basement
Interior volume:	435 cubic metres
Heating system:	electric, forced air
Occupants:	2
Occupancy:	October 1973
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	75mm wood shavings covered with RSI 2.1 glass fibre batts.
Main walls:	38X89mm framing with approx. RSI 1.2 batts.
Basement:	full beamfill, 0.6m above grade. 39m perimeter: entire perimeter with 38X89mm framing and wood panelling, but only 25m with RSI 2.1 glass fibre batts, the remainder being uninsulated; 25m of header area insulated to RSI 5.3 in glass fibre batts.
Doors:	2 @ hollow wood doors with aluminum storm doors.
Windows:	DG sealed units (12mm spacing) in living room picture windows, remainder TG metal sliders.
Air change:	0.24 ac/h natural, kitchen and bathroom exhaust fans, fresh air intake to return air duct.
Heating equipment:	electric furnace approx. 5-6 years old; one electric baseboard heater in basement; old interior chimney blocked off.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 21.5 C; winter basement temp. approx. 21 C.
Humidity:	winter levels high, some window condensation, no humidifier, dryer vented outdoors, some paint peeling on exterior.
Remarks:	only minor energy conservation work possible in this house.

ENERGY RETROFIT

Initial Proposal:	seal and caulk windows and doors. remove wood siding, strap with 38X38mm framing, sheet with 38mm rigid extruded polystyrene board, apply vinyl siding. remove panelling on uninsulated portion of basement wall, install RSI 2.1 glass fibre batts, reinstall panelling. add 1 layer of RSI 3.5 glass fibre batts to attic.
Audit Findings:	selected air leakage sealing, particularly in the upper portions of the envelope, is advisable to protect building against high interior humidities. both the finishing of the basement insulation and the attic insulation upgrade are simple jobs and are advised; attic could be upgraded by RSI 4.9 as easily as RSI 3.5 but marginal payback on the difference would not be very low. single-wall retrofit would result in low energy saving compared to its cost. insufficient potential to meet programme energy saving requirement at reasonable cost.

FILE # ED214

GENERAL DATA

Location:	Beausejour
Vintage:	1959
Style:	bungalow
Wall type:	wood frame, 16% wood siding, 84% stucco
Basement type:	full, concrete
Floor area:	98 square metres above grade, 93 square metres in basement
Interior volume:	456 cubic metres
Heating system:	wood/electric, forced air
Occupants:	5
Occupancy:	June 1973
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	125mm wood shavings plus 75mm loosefill cellulose fibre.
Main walls:	38X89mm framing with approx. RSI 1.2 batts, shiplap sheathing both sides, 2 or more layers of drywall.
Basement:	full beamfill, 0.8m above grade, header areas uninsulated. 39m perimeter: 22m with 38X64mm framing set off wall and approx. RSI 1.8 glass fibre batts and panelling, 17m uninsulated.
Doors:	2 @ wood doors, one with aluminum storm door, the other opening to enclosed space.
Windows:	all DG single-hung and fixed types with wood storms except DG sealed unit (12mm spacing) in living room; one basement window closed off and insulated.
Air change:	0.31 ac/h natural, no exhaust fans, combustion air intake.
Heating equipment:	wood/electric furnace (1981) plus 2 zero-clearance fireplaces, all with interior chimneys; approx. 10 cords of wood used per year.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 20 C.
Humidity:	winter levels low to moderate, no humidifier, minimal window condensation, some frost on exterior wall outlets, dryer vented outdoors.
Remarks:	moderate levels of insulation everywhere in this house, therefore limited potential for sufficient energy savings to meet programme requirements; there is an unheated addition attached to east end of the house.

ENERGY RETROFIT

Initial Proposal:	weatherstrip basement windows and doors. replace 5 windows with TG units. insulate basement walls with 75mm rigid expanded polystyrene board, cover with gypsum board. add RSI 7.0 in blown-in cellulose fibre to attic, and install 8 soffit vents. install glass doors to 2 fireplaces. "insulate" electrical outlets.
Audit Findings:	air sealing throughout house, attic upgrade, and basement insulation components are reasonable energy-conservation and comfort measures for this house, but overall expected energy saving from them would be insufficient to meet programme requirement.

FILE # ED215

GENERAL DATA

Location:	Winnipeg
Vintage:	1965
Style:	bungalow
Wall type:	wood frame, 68% stucco, 32% wood siding
Basement type:	full, concrete
Floor area:	114 square metres above grade, 109 square metres in basement
Interior volume:	544 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1965
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	wood shavings plus blown loosefill glass fibre to RSI 7.0.
Main walls:	38X89mm framing with assumed RSI 1.4 glass fibre batts.
Basement:	full beamfill, 0.75m above grade. 44m perimeter: 40m with 38X64mm framing, panelling, and RSI 1.4 glass fibre batts full depth incl. header, 4m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG aluminum sliders except TG picture window in living room, all in excellent condition.
Air change:	0.15 ac/h natural, exhaust fans in basement rec room and bathroom, and in kitchen and main floor bathroom, fresh air intake to return air duct.
Heating equipment:	original conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney; also natural gas-fired fireplace in rec room with exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	56 h/wk @ 20 C, 56 h/wk @ 16 C, 56 h/wk @ 12 C; winter basement temp. approximately the same as main level.
Humidity:	winter levels low to medium, humidifier disconnected, dryer vented outside, frost buildup at bottom of outer pane of DG sliders, low moisture production by occupants.
Remarks:	newer home not in need of upgrading; central air conditioning.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. replace all main floor DG sliders with TG wood-framed units. replace doors and frames with steel, insulated type. insulate remaining portion of basement wall to RSI 3.5 level and drywall. replace furnace with condensing, pulse-type, high-efficiency unit, plus some minor ductwork in rec room area, setback thermostat.
Audit Findings:	existing home in excellent condition with low energy demand. insufficient potential to meet programme energy saving requirement at reasonable cost.

NOTES:

D.2.2 1½ Storey Houses

Pre-1945:	ED 015	Russell
	ED 090	Brandon
	ED 104	Winnipeg
	ED 145	Winnipeg
	ED 157	Winnipeg
	ED 173	Dauphin
	ED 190	Winnipeg
	ED 196	Poplar Point
1945-70:	ED 013	Winnipeg
	ED 032	Winnipeg
	ED 084	Ste. Rose du Lac
	ED 112	Winnipeg
	ED 134	Winnipeg
	ED 210	Winnipeg
	ED 217	La Broquerie

FILE # ED015

GENERAL DATA

Location:	Russell
Vintage:	pre-1945
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	partial with crawl space, shallow rubble foundation
Heating system:	natural gas, forced air
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Remarks:

ENERGY RETROFIT

Initial Proposal:
- replace all windows with TG units.
- replace one wood door with steel, insulated type.
- reinsulate wall cavities from interior with RSI 2.1 glass fibre batts and refinish on interior with drywall; on exterior, sheet with 50mm rigid expanded polystyrene board and refinish with new siding.
- insulate upper half storey using glass fibre batts.

Audit Findings: work proposed for funding under the programme already well underway at time of energy audit site visit, thus rendering application ineligible for consideration.

FILE # ED090

GENERAL DATA

Location:	Brandon
Vintage:	1914 (2 additions circa 1973, 1975)
Style:	1½ storey, plus 2 storey converted porch, plus 1 storey main floor addition
Wall type:	wood frame, stucco
Basement type:	full, concrete (additions built over crawl spaces)
Floor area:	284 square metres above grade, 46 square metres in basement
Interior volume:	967 cubic metres
Heating system:	oil/wood, forced air, plus electric baseboard heaters
Occupants:	6
Occupancy:	March 1979
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main portion: 89mm vermiculite covered with RSI 3.5 glass fibre batts. side attics, pitched portions, and kneewalls: uninsulated. additions: some areas 1 layer, some 2 layers of RSI 3.5 glass fibre batts. 2 gable-end, 1 roof vent.
Main walls:	double shiplap with cavities filled with wood shavings, topped up in some areas with vermiculite. additions: mostly RSI 1.4 glass fibre batts, some areas 89mm vermiculite.
Basement:	partial beamfill, 0.2m above grade, floors over crawl spaces uninsulated. 67m perimeter incl. crawl spaces: 4m incl. header with 38X89mm framing and RSI 3.5 batts to 0.6m below grade, 3m incl. header with 38X89mm framing and 2 layers of RSI 3.5 batts to 0.6m below grade, 21m incl. header insulated on exterior with approx. 90mm rigid extruded polystyrene to 0.6m below grade and 1m extending horizontally away from wall, 39m uninsulated.
Doors:	1 @ DG sliding patio doors sealed during winter. 6 @ wood doors, 5 of which have wood storm doors, 2 of which open to enclosed porch.
Windows:	9 TG sealed wood units, 4 TG wood casement units, 1 DG sealed wood unit with 1 DG PVC slider, 13 DG single-hung type with storms.
Air change:	0.44 ac/h natural, kitchen exhaust fan sealed in winter, no fresh air intake to return air duct.
Heating equipment:	1977 vintage wood/oil furnace, estimated seasonal efficiency 0.60, exterior chimney; fireplace used; major portion of space heating done with electric baseboard heaters located throughout house.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; winter basement temp. approx. 17 C.
Humidity:	low winter levels, humidifier used, dryer vented outdoors, some historical moisture problems evident in north kneewall area, basement concrete walls.
Remarks:	generally sound old house which has been cared for over the years.

ENERGY RETROFIT

Initial Proposal:	seal, weatherstrip doors, windows, baseboards. insulate pitched ceilings with 38mm rigid extruded polystyrene board. insulate floor over unheated porch with approx. 200mm blown-in loosefill cellulose fibre. insulate kneewalls and side attic floors with RSI 3.5 glass fibre batts. insulate kitchen ceiling with approx. 140mm blown-in loosefill cellulose fibre. finish off basement perimeter insulation with 38mm extruded polystyrene board applied to exterior.
Audit Findings:	large house already relatively well insulated: proposed measures only expected to reduce total annual energy consumption by 29%, which is insufficient to meet programme requirement. expected simple payback periods for most proposed retrofit components are approx. 5-6 years. priorities for this house would be air sealing, attic insulation, and the completion of the insulation around the basement perimeter.

FILE # ED104

GENERAL DATA

Location:	Winnipeg
Vintage:	1919
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, stone and mortar
Floor area:	89 square metres above grade, 43 square metres in basement
Interior volume:	322 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	1
Occupancy:	November 1979
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic and small attics over main floor in each corner: 300mm of blown fibreglass reported (October 1982), possibly over top of wood shavings.
Main walls:	filled with blown-in cellulose fibre, possibly with original wood shavings present in cavities.
Basement:	partial beamfill, 1.0m above grade. 27m perimeter from floor slab to subfloor sprayed with approx. 25mm of urethane/asbestos material, uniform coverage.
Doors:	1 @ wood with wood storm door. 1 @ steel, insulated door.
Windows:	all DG, single- or double-hung type with wood or metal storms, except one newer fixed/awning unit in the kitchen.
Air change:	0.74 ac/h natural, fireplace, no exhaust fans.
Heating equipment:	gas boiler approx. 20 years old, assumed seasonal efficiency 0.60, interior chimney; fireplace used approx. once per month.
Domestic hot water:	natural gas.
Temp. settings:	approx. 56 h/wk @ 16 C (daytime), 112 h/wk @ 18 C; basement winter temp. approx. 16 C.
Humidity:	winter levels low, dryer vented outside, humidifier used.
Remarks:	marked differential settlement, foundation cracks, noticeable slope in some floors.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows and doors (leaky). replace most windows with TG and front door with steel, insulated type. strap exterior walls, apply 50mm rigid extruded polystyrene to 0.6m below grade and finish with vinyl siding.
Audit Findings:	house very leaky: seal, caulk, weatherstrip entire house. exterior wall retrofit should include air/vapour barrier to protect assembly and to effect a significant reduction in air leakage; double layer of RSI 2.1 glass fibre batts with 38X89mm curtain wall suggested; basement portion of exterior work dropped in order to meet programme requirement for cost effectiveness. doors and window replacement not cost effective alone, dropped in support of exterior wall work. basement boiler room lends itself to easy installation of combustion air supply from exterior rather than current interior: significant improvement in seasonal efficiency could be expected for boiler. unacceptable expected simple payback period on retrofit project which includes exterior wall retrofit, although energy saving requirement of programme could be satisfied.

FILE # ED145

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	129 square metres above grade, 85 square metres in basement
Interior volume:	510 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	2
Occupancy:	May 1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central, side attics: blown cellulose fibre on wood shavings, total RSI 7.0 pitched portion: 100mm wood shavings between rafters. kneewalls: 100mm wood shavings between studs plus RSI 2.1 glass fibre batts
Main walls:	100mm wood shavings.
Basement:	full beamfill, 1.3m above grade, header uninsulated. 38m perimeter: above- and below-grade portions strapped and panelled but uninsulated.
Doors:	2 @ wood with wood storms.
Windows:	all DG: mostly single-hung plus storms; one upgraded to fixed/awning unit.
Air change:	0.40 ac/h natural; 2 old bathroom vents to exterior.
Heating equipment:	boiler conversion with circulating pump, assumed seasonal efficiency 0.55, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	84 h/wk @ 24 C, 84 h/wk @ 21 C; winter basement temp: cool 15 C.
Humidity:	winter humidity levels medium, no humdifier used, dryer vented outdoors.
Remarks:	good overall condition, slight tilt due to historical foundation movement.

ENERGY RETROFIT

Initial Proposal:	weatherstrip doors and windows. replace doors with new wood doors. insulate main walls (cavities believed to be empty). insulate and finish entire 36m perimeter of basement to RSI 2.1, cover floor, refinish ceiling. repair broken hot water radiator.
Audit Findings:	main walls were already insulated. insulate basement walls to RSI 3.5, but not right to floor in order to maintain shallow footings above freezing in winter. seal, caulk, weatherstrip entire house. insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED157

GENERAL DATA

Location:	Winnipeg
Vintage:	1930 (est.)
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete (originally house on crawl space)
Floor area:	91 square metres above grade, 66 square metres in basement
Interior volume:	372 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1949
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central and side attics and kneewalls: approx. 89mm wood shavings plus RSI 3.5 glass fibre batts. pitched portions: approx. 89mm wood shavings between rafters.
Main walls:	shiplap sheathing one side only, approx. 89mm cavities uninsulated.
Basement:	0.8m above grade, joists and header on plate on top of concrete wall, insulated with RSI 1.2 batt. 35m perimeter: uninsulated.
Doors:	1 @ single wood door to basement from outdoors. 1 @ wood with wood storm door. 1 @ wood with aluminum storm door.
Windows:	DG single-hung type with wood storms, some SG basement windows.
Air change:	0.59 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	10 year old conventional gas furnace, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 C all the time; winter basement temp. approx. 15 C.
Humidity:	low winter levels, humidifier used.
Remarks:	a well-used older home with significant possibilities for upgrading.

ENERGY RETROFIT

Initial Proposal:	replace all windows with TG, and all doors. from interior, strip 3 walls, apply RSI 2.1 glass fibre batts to cavities, add 50mm foil-faced rigid isocyanurate board, 6 mil polyethylene vapour barrier, drywall. construct vestibule-style entry. rear wall is to be renovated in conjunction with an addition to the house.
Audit Findings:	air sealing is a high priority, along with wall insulation, although method proposed is costly. due to congestion in basement, reasonable only to insulate from exterior (above grade and possibly some below grade) using rigid extruded polystyrene board and suitable finish. window and door replacement cannot be justified on the basis of energy savings alone. time required to organize this retrofit project became a problem.

FILE # ED173

GENERAL DATA

Location:	Dauphin
Vintage:	approx. 1950
Style:	1½ storey
Wall type:	solid log, stucco
Basement type:	full, concrete
Floor area:	115 square metres above grade, 71 square metres in basement
Interior volume:	385 cubic metres
Heating system:	oil, forced air
Occupants:	3
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	pitched portions and kneewalls: approx. 50mm rock wool. horizontal main and side attic portions: 25-50mm rock wool covered with 200mm loosefill cellulose fibre.
Main walls:	side-by-side vertical 100X100mm squared lumber sheathed on both sides with shiplap, stucco on exterior, lath and plaster on interior.
Basement:	partial beamfill, 0.7m above grade, 35m perimeter uninsulated. open cistern occupies 8.4 square metres of basement area in one corner.
Doors:	2 @ wood doors with wood storm doors.
Windows:	9 DG single-hung types with wood storms, 3 DG fixed types with wood storms, 3 TG sealed units (12mm spacings), many rotting frames.
Air change:	0.37 ac/h natural, kitchen exhaust fan closed off, no fresh air intake to return air duct.
Heating equipment:	oil furnace approx. 15 years old, assumed seasonal efficiency 0.65; supplementary heating via wood stove (approx. 5 cords per year); exterior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 21 C; approx. winter basement temp. 18 C.
Humidity:	winter levels moderate, some window condensation and mould growth, some frost on exterior wall electrical outlets, condensation in living room ceiling in side attic, possible rotting of roof boards.
Remarks:	unique construction with good potential for energy-conservation retrofit work.

ENERGY RETROFIT

Initial Proposal:	minor air leakage sealing incl. windows, doors, baseboards, electrical outlets. replace 4 windows with TG units. replace 2 doors with steel, insulated type. exterior wall retrofit including vapour barrier, 38X89mm strapped wall with RSI 2.1 glass fibre batt insulation, 38mm rigid extruded polystyrene sheathing, and hardboard siding. frame and insulate basement to RSI 2.1 plus RSI 1.4 level. add RSI 2.1 glass fibre batts to kneewalls, RSI 3.5 glass fibre to horizontal attic surfaces.
Audit Findings:	air sealing important to prevent continuation of moisture problems. cost of wall retrofit could be reduced by eliminating use of rigid insulation. suggested to convert heating system from oil to electric heating, although wood seems to make up a major portion of existing energy consumption: in terms of energy costs to the homeowners, conversion may not make sense unless they intend to replace use of wood with less labourious fuel supply. air sealing, attic, basement, exterior wall work and off-oil conversion could be combined in several combinations to meet programme requirement for energy saving at reasonable cost, but window and door replacement would be low priority work from the perspective of energy conservation. homeowners lost interest in the programme.

FILE # ED190

GENERAL DATA

Location:	Winnipeg
Vintage:	1920-30 (est.)
Style:	1½ storey
Wall type:	wood frame plus brick on exterior, stucco finish
Basement type:	full, concrete
Floor area:	98 square metres above grade, 51 square metres in basement
Interior volume:	348 cubic metres
Heating system:	electric, forced air
Occupants:	4
Occupancy:	1977
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: 200mm blown cellulose. pitched portions: approx. 89mm blown cellulose between rafters. kneewalls: approx. 89mm wood shavings plus RSI 3.5 glass fibre batts. side attics: approx. 89mm wood shavings plus RSI 3.5 glass fibre batts.
Main walls:	approx. 89mm cavities filled with blown cellulose.
Basement:	full beamfill, 0.7m above grade, header areas uninsulated. 29m perimeter: 2m studded and insulated with RSI 2.1 glass fibre batts, 27m uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG single-hung type with mostly wood storms, some aluminum storms.
Air change:	0.45 ac/h natural (recently underwent air sealing by contractor training new staff), 2 bathrooms with exhaust fans, fresh air intake to return air duct.
Heating equipment:	electric forced-air furnace approx. 2 years old, seasonal efficiency assumed to be 1.0, old interior chimney no longer used.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 10 C; winter basement temp. approx. 13 C.
Humidity:	winter levels medium, no humidifier.
Remarks:	only major upgrading potential is basement insulation.

ENERGY RETROFIT

Initial Proposal:	replace all windows with TG units. replace doors with steel, insulated type. frame and insulate basement from interior with RSI 3.5 glass fibre batts, finish with drywall. blow insulation into pitched portions of attic, add vents. other: upgrade insulation on water tank, insulate water lines, install flow restrictors, install de-humidistats in bathrooms.
Audit Findings:	attic is adequately insulated. window and door replacement not justifiable on the basis of energy savings alone. basement insulation is the only reasonable energy conservation measure at this time, and is not sufficient alone to meet programme requirement for energy saving.

FILE # ED196

GENERAL DATA

Location:	Poplar Point
Vintage:	approx. 1930
Style:	1½ storey
Wall type:	wood frame, wood siding
Basement type:	partial basement, concrete
Floor area:	91 square metres above grade, 31 square metres in basement
Interior volume:	325 cubic metres
Heating system:	wood, space heater with electric backup
Occupants:	4
Occupancy:	longer than 10 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main attic: 100mm wood shavings plus RSI 3.5 glass fibre batts. pitched portions: rafter spaces filled with wood shavings. kneewalls: uninsulated, with drawers. side attic floors: 100mm wood shavings plus 100mm loosefill cellulose fibre.
Main walls:	sheathed both sides, approx. 100mm cavities filled with wood shavings.
Basement:	partial beamfill, 0.5m above grade, header areas uninsulated. 28m perimeter of dugout portion uninsulated; 9 square metre open cistern; 0.9m high crawl space around perimeter covers 9 square metres.
Doors:	2 @ wood doors with wood storm doors.
Windows:	7 DG sashless sliders (40mm spacing), 2 DG casement units (12mm spacing), 2 SG basement windows.
Air change:	0.77 ac/h natural, no exhaust fans, combustion air inlet, or fresh air intake.
Heating equipment:	wood space heater, interior chimney; 10 kW electric forced air furnace (1980) used on weekends.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 18-21 C (varies); winter basement temp. 15 C or less.
Humidity:	winter levels low, window condensation (outer panes), humidifier used often.
Remarks:	Large 3-storey addition planned for south side of house would make major energy saving difficult under programme formulae.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip critical areas in basement, doors, windows, attic penetrations. replace all windows with DG casement type. replace old doors with new wood doors in rebuilt frames. repair and reinsulate approx. 10 square metres of west exterior wall. frame and insulate (from interior) basement walls to RSI 2.1 level. apply ceiling vapour barrier from interior and finish with drywall, then add RSI 2.1 glass fibre batts to attic. construct and install foldable insulated shutters for windows.
Audit Findings:	with planned addition there would be an overall increase in space heating consumption despite implementation of proposed measures to original dwelling.

FILE # ED013

GENERAL DATA

Location:	Winnipeg
Vintage:	1945-50 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	108 square metres above grade, 71 square metres in basement
Interior volume:	422 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	March 1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: wood shavings to top of 89mm joists plus 200mm blown cellulose. side attics: wood shavings to top of 140mm joists plus 200mm blown cellulose. pitched portions: 89mm cavities filled with wood shavings. kneewalls: RSI 2.1 glass fibre batts between studs plus additional layer of RSI 2.1 batts.
Main walls:	approx. RSI 1.2 batts in 89mm cavities.
Basement:	full beamfill, 0.6m above grade. walls and headers fully studded, insulated with RSI 2.1 glass fibre batts, and drywalled during winter of 1981-82.
Doors:	2 @ wood with aluminum storm doors.
Windows:	original windows single-hung type with storms; 2 dining room and 1 kitchen window recently replaced by TG with 12mm spacings; older replacement DG picture window in living room with 12mm spacing; main floor bedroom/den has DG sliding patio doors.
Air change:	0.19 ac/h natural.
Heating equipment:	conventional gas furnace, older, good condition, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	42 h/wk @ 20 C, 126 h/wk @ 18 C; winter basement temp. assumed 16 C.
Humidity:	winter humidity levels medium; both occupants work outside the home; condensation on outer panes of 2nd floor windows.
Remarks:	home in good condition and being modernized by homeowners.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors, attic hatch, dryer vent and old coal chute. replace 3 windows on 2nd floor and 2 on main floor with TG fixed and slider units, and replace 3 basement windows. replace doors with steel insulated units.
Audit Findings:	as proposed, energy savings would be minimal, proposed cost is $4500. subsequent to proposal, homeowners interested in applying rigid extruded polystyrene board and drywall on interior of 2nd floor bedroom north and south gable end walls and on interior of main floor north wall, adding a further 100mm of blown cellulose to attics, insulating part of basement floor with glass fibre batts under a built-up floor, and replacing furnace with a condensing, pulse-type unit: all of these would have expected simple payback periods of approximately 15 years or longer. insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED032

GENERAL DATA

Location:	Winnipeg
Vintage:	1951
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	106 square metres above grade, 66 square metres in basement
Interior volume:	402 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1980 or earlier
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: 50mm mineral wool (kraft-backed), no hatch. side attics: 75mm wood shavings and RSI 3.5 glass fibre batts btwn. joists. pitched portions and kneewalls: 50mm mineral wool (kraft-backed).
Main walls:	50mm mineral wool (kraft-backed).
Basement:	full beamfill, header uninsulated. 0.75m above grade, entire 33m perimeter uninsulated.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door.
Windows:	living room picture window TG with 12mm spacings; remainder DG: single-hung type with metal storms.
Air change:	0.46 ac/h natural.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, good condition, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	assumed 112 h/wk @ 21 C, 56 h/wk @ 18 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low to medium, humidifier used.
Remarks:	typical post-war 1½ storey home without much upgrading since construction.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip basement floor joists, baseboards on upper levels, windows, and door frames by howmeowner. replace all but living room window with TG units. replace interior entrance doors with steel, insulated type. insulate to RSI 3.5 from the interior approx. 60% of basement perimeter (preferred) or 100% of perimeter (possibly, but involves significant plumbing and electrical work). upgrade attic insulation where and if applicable and install turbine-type ventilator. other: 2 speed fan to be installed on heating system to improve circulation, vacuum ductwork, setback thermostat, dimmers on 8 overhead lights, fluorescent lighting in kitchen, insulate water lines and upgrade water heater insulation, install water flow restrictors.
Audit Findings:	energy saving from window and door replacement does not justify proposed cost. homeowners' preferred basement insulation option: 60% of perimeter as above. attic and kneewall insulation upgrade would be applicable. possible cost-effective energy saving measure: furnace replacement with high efficient type. a reasonable energy conservation retrofit project would include the above three measures to meet programme energy saving requirement. homeowners most interested in window and door replacement and basement development.

FILE # ED084

GENERAL DATA

Location:	Ste. Rose du Lac
Vintage:	1955-60 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	120 square metres above grade, 83 square metres in basement
Interior volume:	493 cubic metres
Heating system:	electric, forced air
Occupants:	3
Occupancy:	June 1977
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: 280mm loosefill cellulose fibre, 2 peak, 1 gable vent. pitched portions and kneewalls: uninsulated. main floor ceilings and side attic floors: approx. 89mm wood shavings plus 170mm loosefill cellulose fibre.
Main walls:	38X89mm framing with UFFI.
Basement:	partial beamfill, 0.6m above grade, 41m perimeter uninsulated incl. header. 8 square metre cistern, 1.8m high.
Doors:	3 @ wood doors, 1 of which opens to unheated storm entry, 1 of which with aluminum storm door.
Windows:	all DG in winter, 2 DG wood sealed units in living room, 5 DG combination sealed units above PVC sliders, 12 DG single-hung or fixed types with storms.
Air change:	0.32 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	electric furnace, 6-7 years old, interior chimney sealed off.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 15 C.
Humidity:	winter levels medium, indoor drying of clothes, evidence of moisture damage in attic and on ceilings.
Remarks:	electricity use includes equipment for farm (e.g., welder, lighting, etc.).

ENERGY RETROFIT

Initial Proposal:	seal, weatherstrip around doors and windows. replace 7 DG (single plus storms) with TG units. after UFFI removal, fur out studs, install RSI 3.5 glass fibre batts, sheet with 38mm rigid extruded polystyrene board, apply new siding. insulate exterior of foundation wall to 0.6m below grade with rigid extruded polystyrene board, cover with fibreboard. apply vapour barrier in attic, insulate pitched portions with blown-in loosefill cellulose fibre.
Audit Findings:	house fairly well insulated already except for basement which is a high priority for upgrading. UFFI removal would present excellent opportunity to upgrade wall thermal resistance, but even when combined with other proposed retrofit measures there is insufficient potential to meet programme requirement for energy saving at reasonable cost (estimated max. 37% total annual energy saving with expected simple payback period of approx. 24 years).

FILE # ED112

GENERAL DATA

Location:	Winnipeg
Vintage:	1949
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	103 square metres above grade, 85 square metres in basement
Interior volume:	394 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	1949
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: approx. RSI 1.2 kraft-backed mineral wool plus RSI 3.5 glass fibre batts, two gable-end vents. pitched portions: approx. RSI 1.2 kraft-backed mineral wool plus RSI 1.2 glass fibre batt slightly compressed. vented side attic: kneewalls with RSI 3.5 glass fibre batts and floor with 140mm shavings, floorboards, and 50mm loosefill cellulose. unvented side attics on either side of dormer: RSI 2.1 batts on kneewalls and RSI 1.2 on underside of roof and end walls.
Main walls:	38X89mm framing with RSI 1.2 mineral wool (kraft-backed).
Basement:	full beamfill, 0.75m above grade. header insulated with 38mm rigid expanded polystyrene board or RSI 1.4 glass fibre batts, depending on location. 32m perimeter: 24m framed and insulated to floor with RSI 1.8 glass fibre batts (kraft-backed) and panelled, 5m have 38mm rigid expanded polystyrene, 3m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung wood type with metal storm, except one DG alum. slider in main floor bedroom, two DG sealed units (12mm spacing) in living room and den with a third exterior pane on the living room picture window.
Air change:	0.20 ac/h natural, no exhaust fans, no fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil) approx. 25 years old, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 22 C, 56 h/wk @ 20 C; winter basement temp. approx. 19 C; 2nd level sometimes allowed to cool off if not in use.
Humidity:	winter levels low to medium, humidifier present but rarely used, dryer vented outside.
Remarks:	one-owner house gradually upgraded over the years, low energy bill.

ENERGY RETROFIT

Initial Proposal:	upgrade door weatherstripping, renew caulking around windows and caulk baseboards on 2nd level, caulk in basement. replace windows on 2nd level and one main floor window with TG, add third pane to main floor bedroom window, replace checkrail of bathroom window. replace front door and frame. upgrade insulation in 2nd level gable end walls from interior. minor upgrading of basement header insulation and caulking. add approx. 100mm blown cellulose to central attic, seal electrical boxes, add 3 roof vents. replace furnace with energy efficient (power vent damper/spark ignit.) unit.
Audit Findings:	house is a fine specimen of its age: not enough cost effective measures may be implemented to meet programme requirement for energy savings. remaining 3m of basement wall could be insulated and 2nd level gable end walls could be upgraded at reasonable cost relative to expected results but window and door work not justifiable on the basis of energy savings alone.

FILE # ED134

GENERAL DATA

Location:	Winnipeg
Vintage:	1950 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	130 square metres above grade, 68 square metres in basement
Interior volume:	473 cubic metres
Heating system:	natural gas, forced air
Occupants:	6
Occupancy:	1975
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central and side attics: 75mm wood shavings plus 75mm vermiculite plus RSI 3.5 batts over approx. 75%, 75mm wood shavings only over 25%. pitched portions: 89mm rafter spaces filled with wood shavings. kneewalls: kraft-backed RSI 1.2 mineral wool plus RSI 3.5 glass fibre batts.
Main walls:	89mm cavities with RSI 1.2 batts.
Basement:	full beamfill, 0.85m above grade. 34m perimeter: 5m framed and insulated with RSI 1.2 kraft-backed batts, 17m framed and insulated with RSI 2.1 glass fibre batts, 12m uninsulated.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door.
Windows:	all DG single-hung type with wood storms except one TG fixed (12mm spacings) picture window in living room.
Air change:	0.25 ac/h natural, bathroom and basement exhaust fans, no fresh air intake to return air duct.
Heating equipment:	conversion unit (orig. coal, then oil), assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 18 C, 56 h/wk @ 15 C; approx. winter basement temp. 15 C.
Humidity:	winter levels high (mould growth extensive), condensation even on TG, humidifier not used.
Remarks:	number of occupants high for size of house, therefore high interior moisture production.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip window and door frames, basement header areas. replace DG windows with TG units. double wall retrofit by contractor with 6 mil polyethylene vapour barrier, 38X89mm framing, RSI 5.6 in glass fibre batts, plywood sheathing, stucco. insulate uninsulated portion of basement wall to RSI 4.2 from interior. inspect attic for deficiencies, upgrade if appropriate.
Audit Findings:	window replacement not a high priority for homeowner, but may be practical to do at the same time as double-wall retrofit. cost recovery through energy saved very poor for wall retrofit or window replacement. high priority to deal with moisture problem in house before serious structural damage results. cost effective to upgrade previously unaltered portion of attic spaces and to finish basement insulation. reasonable to consider replacement of furnace with high-efficiency type, but moisture problem would have to be addressed at the same time. because attic and basement already partially upgraded, insufficient potential to meet programme requirement for total energy saving at reasonable cost.

FILE # ED210

GENERAL DATA

Location:	Winnipeg
Vintage:	1950 (est.)
Style:	1½ storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	110 square metres above grade, 66 square metres in basement
Interior volume:	413 cubic metres
Heating system:	natural gas, forced air
Occupants:	4
Occupancy:	1972
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central and side attics: 2 layers of RSI 3.5 glass fibre batts. pitched portions: RSI 1.2 mineral wool (kraft-backed) between rafters. kneewalls: RSI 2.1 glass fibre batts between studs.
Main walls:	dormer exterior walls: renovated to RSI 2.1 glass fibre batts and drywall. other main walls: 38X89mm framing with RSI 1.2 mineral wool (kraft-backed), shiplap sheathing, lath and plaster interior finish.
Basement:	full beamfill, 0.7m above grade, header area uninsulated. 33.5m perimeter mostly with 38X38mm framing and panelling but uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	living room picture window DG fixed type with 3rd storm pane, dining room window DG aluminum slider, remainder DG single-hung type with aluminum storms (batt insulation placed between panes along bottom to prevent condensation).
Air change:	0.41 ac/h natural, no exhaust fans, no fresh air intake to return air duct.
Heating equipment:	old oil furnace converted to nat. gas, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 17 C.
Humidity:	winter levels low to medium, humidifier used, clothes dried outdoors.
Remarks:	typical 1½ storey home of the period; upper level has been redecorated and improved somewhat.

ENERGY RETROFIT

Initial Proposal:	seal and caulk window and door frames on main floor. replace 2nd level windows with TG units. move basement panelling and strap framing in order to insulate to RSI 2.1 level with glass fibre batts. replace furnace with high-efficiency condensing type.
Audit Findings:	basement insulation suggested as RSI 3.5. inclusion of window replacements in proposal is detrimental to overall cost effectiveness. basement and furnace components of proposal have expected simple payback periods of 10-15 years; with windows, this increases to greater than 15 years. minimum energy-saving requirement of the programme cannot be achieved with any combination of the above.

FILE # ED217

GENERAL DATA

Location:	La Broquerie
Vintage:	1947 (moved to site in 1957 and enlarged)
Style:	1½ storey with single-storey addition
Wall type:	wood frame, aluminum and wood siding
Basement type:	full, concrete (crawl space under addition)
Floor area:	157 square metres above grade, 62 square metres in basement
Interior volume:	545 cubic metres
Heating system:	electric, forced air
Occupants:	6
Occupancy:	likely longer than 20 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main attic: 100mm wood shavings plus 180mm loosefill cellulose fibre. pitched portions and kneewalls: uninsulated. side attic floors: 190mm wood shavings.
Main walls:	shiplap both sides, fibreboard sheathing also on exterior, 38X89mm framing with empty cavities reported by homeowner.
Basement:	joists, headers on concrete wall 0.7m above grade. 32m perimeter: 25m with 38X64mm framing and RSI 1.4 glass fibre batts and drywall, 7m uninsulated. 25m of header areas insulated with RSI 2.1 glass fibre batts.
Doors:	2 @ wood with aluminum storm doors.
Windows:	mainly DG aluminum sliders except living room sealed unit (12mm spacing), and SG window in basement.
Air change:	0.46 ac/h natural, bathroom and kitchen exhaust fans, no fresh air intake to return air duct.
Heating equipment:	electric furnace (1981), old interior chimney closed off.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 21 C; winter basement temp. approx. 20 C.
Humidity:	winter levels medium, some main floor window condensation, basement mould growth, some frost on exterior wall electrical outlets in addition.
Remarks:	addition partly used for commercial business operated by homeowners.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip windows, doors, electrical outlets. close off 3 windows, replace one with TG unit. remove 18-year-old siding, apply vapour barrier, strap walls with 38X140mm studs, apply RSI 3.5 glass fibre batts, new aluminum siding.
Audit Findings:	complete air leakage sealing is appropriate for this house, although if exterior walls were filled with insulation much of the infiltration would be reduced; critical exfiltration areas would have to be done to prevent moisture damage. if siding is to be replaced, empty wall cavities should be blown full of loosefill material; beyond that, cost effectiveness of wall retrofit work is doubtful. house not acceptable under the programme because of the commercial operation therein.

D.2.3 1 3/4, 2 Storey Houses

Pre-1945:	ED 007	St. Andrews
	ED 011	Winnipeg
	ED 026	Winnipeg
	ED 072	St. Alphonse
	ED 075	The Pas
	ED 079	Woodlands
	ED 082	Winnipeg
	ED 092	Souris
	ED 105	Boissevain
	ED 109	Winnipeg
	ED 125	Tyndall
	ED 158	Winnipeg
	ED 179	Swan River
	ED 191	Dauphin
	ED 218	La Broquerie
	ED 224	Winnipeg
	ED 225	Winnipeg
	ED 230	Winnipeg
1945-70:	ED 122	Winnipeg
	ED 123	Winnipeg

FILE # ED007

GENERAL DATA

Location:	St. Andrews
Vintage:	1920-30 (est.)
Style:	one and three-quarter storey
Wall type:	wood frame, stucco over wood siding
Basement type:	almost full, concrete liner inside original perimeter foundation wall
Floor area:	98 square metres above grade, 38 square metres in basement
Interior volume:	345 cubic metres
Heating system:	oil, forced air
Occupants:	4
Occupancy:	July 1976
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main attic: 230mm wood shavings plus RSI 2.1 glass fibre batts. pitched portions: possibly empty spaces between rafters.
Main walls:	shiplap both sides, empty wall cavities except 7.5m section of main floor wall which has been insulated with RSI 2.1 batts and refinished.
Basement:	0.2m above grade, header areas insulated with RSI 2.1 glass fibre batts. 25m perimeter uninsulated; concrete liner in dug out basement: shallow footing is deteriorating.
Doors:	2 @ wood doors without storm doors, but 1 opens to enclosed porch.
Windows:	mainly DG horizontal sliders.
Air change:	0.85 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 19 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low.
Remarks:	foundation of this house needs to be rebuilt; homeowner plans pressure-treated wood replacement for the existing system.

ENERGY RETROFIT

Initial Proposal:	replace kitchen and bathroom windows. replace 1 door. double wall retrofit, including blowing loosefill cellulose into existing wall cavities before constructing new outer wall system. convert from oil heating system to 15 kW electric forced air furnace and four 1 kW baseboard heaters for the upper storey.
Audit Findings:	replacement of existing door in poor condition and window upgrade can be included in retrofit package without adversely affecting overall cost effectiveness, although analysis indicates assumption of uninsulated walls causes overprediction of pre-retrofit heating load, i.e., savings may not be as significant as expected. a careful whole-house air leakage sealing effort should accompany exterior wall work. door and window components of proposal modified somewhat over time, but wall and heating system retrofit proposals acceptable with only minor suggestions as to approach. homeowner withdrew from programme.

FILE # ED011

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	107 square metres above grade, 52 square metres in basement
Interior volume:	421 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	January 1983
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	100mm sawdust between ceiling joists.
Main walls:	sheathed both sides, possibly 100mm cavities filled with sawdust or similar.
Basement:	0.9m above grade, 250mm stone and mortar wall uninsulated.
Doors:	3 @ wood with wood storm doors.
Windows:	all DG: wood single-hung type with exterior storms, large spacing between glazings.
Air change:	0.35 ac/h natural.
Heating equipment:	natural gas conversion unit, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	unknown: home recently purchased; previous owner did not continuously occupy home during last few years, so temp. setting possibly lower than 18 C.
Humidity:	winter levels likely low.
Remarks:	substantial upgrading and renovation planned by new owners; house appears to be structurally sound.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. exterior wall retrofit 150 net square metres, including 6 mil poly vapour barrier, 100mm of rigid extruded polystyrene sheathing, strapping, and vinyl siding, by homeowner. interior basement insulation of entire perimeter to RSI 3.5 using glass fibre batts and 6 mil poly vapour barrier, by homeowner. modify attic to enlarge 2nd floor space with raised collar ties and finished cathedral ceilings, RSI 3.5 insulation levels, ventilation of modified attic space, by homeowner. setback thermostat. modify porch and insulate to RSI 3.5 levels to act as airlock entrance, by homeowner.
Audit Findings:	overall project extensive and costly; airlock and thermostat dropped from proposal. desirable to insulate ceiling to RSI 7.0 level. suggest cost reduction for wall retrofit by using glass fibre batts and framing in place of rigid material, i.e., double-wall retrofit. proposal would result in energy savings which would satisfy programme requirement, with marginally favourable economics effected by low labour cost because homeowner to do most of the work. homeowner unable to fund his portion of the project.

FILE # ED026

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete (circa 1960)
Floor area:	134 square metres above grade, 71 square metres in basement
Interior volume:	533 cubic metres
Heating system:	natural gas, forced air
Occupants:	5
Occupancy:	more than 20 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	50mm wood fibre and RSI 2.1 glass fibre batts to top of ceiling joists plus 1 layer of RSI 2.1 batts over top. minor ceiling area on main floor: 2 layers of RSI 2.1 glass fibre batts.
Main walls:	sheathed both sides, 100mm cavities filled with blown wood fibre circa. 1960-65.
Basement:	full beamfill, 1.25m above grade. 23m perimeter of header space insulated to RSI 2.1, 11m uninsulated. 17m perimeter of wall insulated full depth to RSI 1.4, 17m to RSI 2.1, all glass fibre batts, all panelled.
Doors:	3 @ wood with wood storm doors.
Windows:	mostly DG metal sliders, approx. 60% of total glazed area has a third outer storm pane.
Air change:	0.32 ac/h natural, passive bathroom vent and dryer vent to exterior, no exhaust fans
Heating equipment:	conventional gas furnace, approx. 19 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	20-21 C all the time.
Humidity:	winter humidity levels low, humidifier used.
Remarks:	stylish, well-maintained home.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip all doors and windows. replace one poorly fitting door. add 3rd storm pane to two 2nd floor windows. upgrade ceiling insulation by adding another layer of RSI 2.1 batts. replace furnace with condensing, high-efficiency type
Audit Findings:	all proposed work except furnace replacement would reduce energy consumption insignificantly. suggest completion of basement header insulation. furnace replacement marginally cost-effective (approx. 12 year simple payback) but energy savings insufficient to meet programme requirement.

FILE # ED072

GENERAL DATA

Location:	St. Alphonse
Vintage:	pre-1920 (est.)
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	153 square metres above grade, 57 square metres in basement
Interior volume:	571 cubic metres
Heating system:	electric/wood, forced air
Occupants:	9
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main portion: 100mm wood shavings plus 150mm blown-in cellulose fibre. pitched portions: likely 100mm wood shavings in rafter spaces.
Main walls:	shiplap both sides, approx. 100mm cavities filled with wood shavings.
Basement:	joists, headers on top of foundation wall, 0.3m above grade. 34m perimeter: 12m with 38X89mm framing and panelling but empty cavities, 22m uninsulated; header areas uninsulated.
Doors:	2 @ wood with wood storm doors, one of which is unused and is insulated with RSI 3.5 glass fibre batts. 1 @ steel, insulated door without a storm door.
Windows:	all DG single-plus-storm types except DG sealed units (12mm spacing) in kitchen.
Air change:	0.32 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	wood/electric forced air furnace (1982), replacing oil furnace.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21.5 C, 56 h/wk @ 20 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low, no humidifier on new furnace but humidifier was used in conjunction with old oil furnace, dryer vented outdoors.
Remarks:	42 square metre slab-on-grade addition to house is planned.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip selected areas including windows and doors. replace all existing windows with TG sealed and casement units. replace one door with steel, insulated type and close off unused door. sheet house exterior with 38mm semi-rigid glass fibre sheathing or rigid extruded polystyrene board and apply vinyl siding. cover exterior of upper portion of basement walls with 38mm rigid extruded polystyrene board and pressure-treated plywood finish.
Audit Findings:	proposed cost of above measures is far in excess of programme upper limit. revised proposal submitted, which included minor air sealing, windows, doors, main wall reinsulation at reduced cost; the inclusion of the major addition to the house makes significant overall reduction in energy consumption difficult, and the proposed measures are costly compared to the expected energy savings: project falls well short of meeting programme requirements.

FILE # ED075

GENERAL DATA

Location:	The Pas
Vintage:	1925 (est.)
Style:	2 storey
Wall type:	wood frame, wood siding (shakes)
Basement type:	full, concrete
Floor area:	245 square metres above grade, 117 square metres in basement
Interior volume:	945 cubic metres
Heating system:	oil, forced air
Occupants:	2
Occupancy:	October 1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main attic, west bedroom: 125mm vermiculite; inadequate ventilation. east entranceway: no insulation materials.
Main walls:	main floor walls: buffalo board sheathing, approx. 38X89mm framing with RSI 2.1 glass fibre batts, drywall. upper level: shiplap sheathing, same framing as main floor but with a layer of wood lath and plaster within the cavities as well as on the interior surface.
Basement:	full beamfill, 0.2m above grade, 47m perimeter uninsulated below header. header: insulated on exterior with 25mm rigid expanded polystyrene board.
Doors:	2 @ 45mm wood french doors with wood storm doors. 5 @ 44mm wood doors, 2 without storms, 2 with wood storms, 1 opening to enclosed porch.
Windows:	approx. 16 square metres of DG single-hung with wood storms, 2 square metres of TG surface.
Air change:	0.39 ac/h natural, main floor bathroom exhaust fan, no fresh air intake to return air duct.
Heating equipment:	newer oil furnace (circa 1978), assumed seasonal efficiency 0.65, interior chimney; 3 supplementary electric baseboard heaters in bedrooms and bathroom; open stone fireplace on main floor with exterior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20.5 C, 56 h/wk @ 18 C; winter basement temp. much cooler as unheated space; upper level kept cold in winter because of cost of heating compared to use of the space.
Humidity:	winter levels low to moderate, no window condensation, dryer vented outdoors, no humidifier.
Remarks:	interior moisture or combustion air problems unlikely because of small number of occupants compared to interior volume.

ENERGY RETROFIT

Initial Proposal:	weatherstrip doors and windows. close in 4 windows, replace 6 windows with TG units. replace 2 storm doors. insulate upper level walls from interior in the same manner as on the main level: remove lath and plaster, install RSI 2.1 batts, drywall. add 1 layer of glass fibre batts to attic areas. replace oil furnace with electric forced air unit and install 6-8 baseboard heaters. install fireplace insert with blower to improve efficiency.
Audit Findings:	extensive interior retrofit work planned: cost would be high for all proposed components unless homeowner provides some of the labour. major air leakage sealing effort is advisable to protect structure from effects of possible future higher humidity levels, especially in the upper portion of the building envelope. suggested attic insulation upgrade is additional RSI 4.9. suggested to insulate basement with 50mm expanded polystyrene to at least 0.6m below grade, including joist spaces. windows and doors in need of upgrading but lowest on the scale of energy-conservation priorities; fireplace insert would be considered to be a renovation measure not fundable under the programme. remaining measures cost effective and together meet programme requirement for energy saving; existing furnace is not very old, however. homeowners unable to schedule retrofit project to meet programme deadlines.

FILE # ED122

GENERAL DATA

Location:	Winnipeg
Vintage:	1969
Style:	2 storey
Wall type:	wood frame, stucco with minor amount of wood siding
Basement type:	full, concrete
Floor area:	100 square metres above grade, 45 square metres in basement
Interior volume:	364 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	July 1969
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	orig. wood snavings plus RSI 2.1 glass fibre batts plus 150-175mm loosefill cellulose totalling at least RSI 7.0.
Main walls:	assumed RSI 1.4 glass fibre; 2nd level overhangs 1st along front of house.
Basement:	full beamfill, 0.9m above grade. 89mm framing with RSI 2.1 glass fibre batts full height, panelled finish.
Doors:	1 @ wood with wood storm door. 1 @ steel, insulated type with wood storm door.
Windows:	living room picture window upgraded to TG (12mm spacings), remainder DG wood fixed/awning units except 3 upper level bedrooms and stairway window with additional interior 3rd pane.
Air change:	0.14 ac/h natural, bathroom and kitchen fans used.
Heating equipment:	conventional gas furnace, original unit, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; approx. winter basement temp. 17 C.
Humidity:	winter levels high, many showers taken, humidifier used continuously, dryer vents outside.
Remarks:	newer house, quite airtight, high interior moisture production, evidence of interior moisture damage in vicinity of windows which frost up in winter (particularly upper level bedrooms).

ENERGY RETROFIT

Initial Proposal:	replace 2 north-facing bedroom windows with TG units (PVC frames). replace orig. furnace with high-efficiency condensing type.
Audit Findings:	see above remarks about moisture problem: could be mitigated somewhat through reduction of high moisture production levels. insufficient potential to meet programme requirement for energy savings at reasonable cost.

FILE # ED079

GENERAL DATA

Location:	Woodlands
Vintage:	1920 (est.)
Style:	one and three-quarter storey with additions
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar under original building; additions on crawl spaces
Floor area:	120 square metres above grade, 49 square metres in basement
Interior volume:	387 cubic metres
Heating system:	oil, forced air
Occupants:	3
Occupancy:	unknown
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	pitched portions: rafter spaces likely filled with vermiculite. horizontal portion of orig. building: 38mm vermiculite plus 2 layers of RSI 3.5 glass fibre batts. additions: 2 layers of RSI 3.5 glass fibre batts.
Main walls:	board sheathing both sides of main building walls, panelling as interior finish, intermediate layer of tar paper in stud cavities. additions: 38X89mm framing, fibreboard sheathing, panelled interior finish, and RSI 2.1 glass fibre batts.
Basement:	joists, headers on stone foundation walls (main building) 0.5m above grade, or on concrete blocks (crawl spaces under additions) 0.5m and 0.6m above grade: entire perimeter uninsulated, gravel floor.
Doors:	2 @ hollow wood doors, 1 with wood storm door, 1 with aluminum storm door.
Windows:	all DG, aluminum sliders in additions, single-hung with storms in main structure, 2 in family room are DG sealed units (12mm spacing).
Air change:	0.89 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	newer oil furnace (4 years old), assumed seasonal efficiency 0.65; wood stove used occasionally (approx. 1 cord per year); interior chimney.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 19.5 C; winter basement temp. approx. 15 C or lower.
Humidity:	winter levels low, no humidifier, dryer vented outdoors.
Remarks:	promising example for energy-conservation retrofit; history of ice damming on roof and condensation in walls.

ENERGY RETROFIT

Initial Proposal:	replace 7 windows with TG awning types. double-wall retrofit on original portion of house: entire east wall and 2nd storey north, south, and west walls. on interior of pitched ceilings, apply 38mm extruded polystyrene board and gypsum board cover; remove existing insulation in rafter spaces to improve ventilation therein. install additional vents including wind-powered unit.
Audit Findings:	window replacement should be lowest priority because of low energy saving vs. cost of implementation. could install air chutes in pitched rafter spaces and retain approx. 50mm vermiculite therein along with interior surface retrofit. important to implement complete air sealing effort in house to reduce associated heat loss and moisture migration. suggested to insulate exterior of foundation and crawl space walls with at least 50mm extruded polystyrene in conjunction with air leakage sealing in this area. double-wall retrofit is appropriate in light of existing construction of walls. conversion to electric heating appropriate to save energy but oil furnace is almost new: duct heater is a possibility. too many difficulties experienced by homeowner in obtaining quotations for proposed work to meet programme requirements and schedule.

FILE # ED123

GENERAL DATA

Location:	Winnipeg
Vintage:	1950 (est.)
Style:	2 storey
Wall type:	wood frame, 86% stucco, 14% wood siding
Basement type:	full, concrete
Floor area:	120 square metres above grade, 56 square metres in basement
Interior volume:	433 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	January 1983
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	75-85mm wood shavings, 2 vents.
Main walls:	assumed RSI 1.2 batts, 38X89mm framing.
Basement:	full beamfill, 0.7m above grade, header uninsulated. 31m perimeter: 14m framed and panelled to floor with RSI 1.4 glass fibre batts, 17m uninsulated.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung type with wood storms, except SG in bathroom: most quite leaky.
Air change:	0.33 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	gas conversion unit (orig. oil), at least 20 years old, possibly original, assumed seasonal efficiency 0.65, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	previous occupancy settings unknown; currently approx. 112 h/wk @ 20 C, 56 h/wk @ 18 C; winter basement temp. approx. 17 C.
Humidity:	winter levels low, humidifier disconnected, dryer vented outside.
Remarks:	only minor repairs and no major alterations since time of construction.

ENERGY RETROFIT

Initial Proposal:	weatherstrip front and back doors. replace all windows with TG units. insulate entire perimeter of basement to RSI 2.1 level plus drywall, including previously finished portion, by homeowner. top up spaces between ceiling joists with vermiculite, apply and seal polyethylene vapour barrier, cover with RSI 5.6 in layers of glass fibre batts, add additional vents, by homeowner.
Audit Findings:	house ideal for basic energy conservation retrofit work in basement and attic. window replacement alone cannot be justified on the basis of energy to be saved (incl. reduced air leakage), but with homeowner labour component of other proposed work, expected simple payback period for the whole package is just less than 20 years. additional energy could be saved by including replacement of furnace with higher-efficiency type, but expected simple paybacks would be virtually unchanged from ceiling/basement/windows project. exclusion of window replacement from proposal results in expected simple payback periods well under 10 years, and only slightly higher with furnace replacement. homeowners opted for self-funded window replacement, and were unable to commit funds for other energy conservation measures.

FILE # ED082

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	full, brick
Floor area:	135 square metres above grade, 68 square metres in basement
Interior volume:	516 cubic metres
Heating system:	natural gas, hot water
Occupants:	4
Occupancy:	September 1982
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	wood shavings and blown cellulose to RSI 7.0, ample venting.
Main walls:	sheathed both sides with 100mm cavities filled with wood shavings. most of east wall opens to an unheated attic space or enclosed unheated porch; half of west main floor wall opens to enclosed unheated porch.
Basement:	2 courses of bricks, significant cracking, floor slab movement, seepage. 1.2m above grade, 33m perimeter, uninsulated.
Doors:	1 @ wood, opening into enclosed unheated east porch. 1 @ wood with wood storm door, opening into enclosed unheated west porch. 1 @ wood with wood storm door, on the north side.
Windows:	all DG, single-hung with metal or wood-framed storms.
Air change:	0.95 ac/h natural (largely in the basement)
Heating equipment:	old gas boiler conversion, no circulating pump, assumed seasonal efficiency 0.50, interior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 21 C, 56 h/wk @ 18 C; winter basement temp. 10-15 C.
Humidity:	low winter levels, no humidifier, dryer vents outside, upper level windows freeze up.
Remarks:	basement major contributor to heat loss, i.e., uninsulated and very leaky.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, and weatherstrip entire house. replace outer storms on 7 windows with aluminum storms and install interior third panes on 18 windows. renovate storm doors with aluminum replacements. seal brick basement walls, stud and insulate. other: circulating pump, insulate water lines and heater tank, dimmers.
Audit Findings:	air leakage reduction is a major priority, particularly in the basement and through the windows. basement insulation is important because of the large exposed area above grade, but foundation is currently very fragile and must be kept at a relatively uniform temperature: exterior method should be considered and brick walls should be properly cared for prior to insulation. possible to achieve programme requirement for energy saving with careful planning of proposal to control costs. homeowners informed of impending transfer out of province - withdrew proposal.

FILE # ED092

GENERAL DATA

Location:	Souris
Vintage:	1916
Style:	2 storey
Wall type:	wood frame, aluminum siding
Basement type:	full, concrete, with minor addition built as slab on grade
Floor area:	110 square metres above grade in main building, 20 square metres in main floor addition, 52 square metres in basement
Interior volume:	493 cubic metres
Heating system:	oil, forced air, with electric heating in the addition
Occupants:	4
Occupancy:	1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	main attic: floorboards, which serve to enclose joist spaces, are covered with polyethylene and one layer of RSI 3.5 glass fibre batts; attic is unvented.
	ceiling over addition: 2 layers of RSI 3.5 glass fibre batts, area vented.
Main walls:	main building: approx. 50X100mm framing, shiplap sheathing both sides, drop-style wood siding covered with new aluminum siding, uninsulated cavities.
	addition: 38X140mm framing, RSI 3.5 glass fibre batts, drywall, 38mm rigid glass fibre exterior sheathing, aluminum siding.
Basement:	partial or full beamfill, 0.2m above grade, 29m perimeter, 8m common with slab edge, half of which is patio, half main floor addition.
	slab perimeter: insulated on edge and out 0.6m with 38mm rigid extruded polystyrene board, with some complication along adjoining patio slab.
	main basement: concrete slightly crumbly on interior, uninsulated.
	6 square metre cistern in one corner.
Doors:	1 @ steel, insulated type facing east.
	1 @ wood with aluminum storm door facing south.
Windows:	2nd level windows DG single-hung type with aluminum storms, with one DG sashless slider; main floor windows mostly upgraded from original: DG sealed units (12mm spacing), DG sashless slider, TG door sidelite.
Air change:	0.32 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	7 year old oil furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 19 C; winter basement temp. approx. 17 C except approx. 6 C in cold storage area.
Humidity:	winter levels low, portable humidifiers used, dryer vented outside.
Remarks:	upper level relatively unaltered but main floor modernized, therefore unfortunate that new aluminum siding in place: complicates wall insulation upgrade; well cared-for house.

ENERGY RETROFIT

Initial Proposal:	replace 5 DG windows with TG units.
	replace door with steel, insulated type.
	insulate walls by blowing in glass fibre from interior.
	close off two unneeded basement windows (they open to wells and are not too effective at allowing light penetration).
	install wood-burning furnace to reduce oil consumption.
Audit Findings:	door and window replacement aesthetic improvement but not justifiable on the basis of energy saving alone.
	attic access door main air leakage path through ceiling; if weatherstripped attic insulation could be upgraded by RSI 3.5 and some vents provided.
	wood burning would not reduce energy consumption, just the cost.
	good condition of furnace makes this a possible application for electric plenum heater, i.e., oil/electric hybrid.
	basement most appropriately insulated with exterior skirt, but homeowners reluctant to alter recent landscaping near house.

FILE # ED105

GENERAL DATA

Location:	Boissevain
Vintage:	1900
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding
Basement type:	partial, concrete
Floor area:	195 square metres above grade, 45 square metres in basement
Interior volume:	595 cubic metres
Heating system:	oil, forced air
Occupants:	5-6
Occupancy:	October 1982
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central and pitched portions: approx. 90mm wood shavings. dropped portions: approx. 90mm wood shavings and RSI 2.1 glass fibre batts.
Main walls:	shiplap sheathing, wall cavities filled with wood shavings, some settlement.
Basement:	partial beamfill, 0.4m above grade, header areas uninsulated. 36m perimeter, uninsulated; 0.8m high crawl space covers 46 square metres.
Doors:	2 @ 44mm wood doors with wood storm doors.
Windows:	1 fixed SG window, 15 single-hung windows of which 5 have wood storms in winter.
Air change:	0.5 ac/h natural assumed (house too leaky to estimate airtightness), no exhaust fans, vacuum cleaner vented to exterior, no fresh air intake to return air duct.
Heating equipment:	newer oil furnace (circa 1968), assumed seasonal efficiency 0.65; additional space heating accomplished with wood stove (approx. two 3/4 ton truck loads [approx. 3 cords?] of wood used in 1982/83 winter) and two portable electric space heaters; interior chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 16 C; approx. winter basement temp. 18 C.
Humidity:	winter levels moderate, humidifier used, minimal window condensation, clothes hung to dry indoors in winter.
Remarks:	evidence of severe structural problems (uneven floors, temporary bracing of beams, cracking of concrete walls): these would have to be corrected before energy conservation work would become a reasonable priority; energy conservation potential is significant.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. add metal storm windows to SG windows. single-wall retrofit: sheet exterior with 38mm rigid extruded polystyrene board, apply new siding. frame and insulate basement and crawl space to RSI 3.5 level. add 200mm blown-in loosefill cellulose fibre to attic.
Audit Findings:	project could not be approved without correction of structural problems. conversion to all-electric heating would be cost effective. air sealing and window improvements are priorities, along with insulation of foundation perimeter. advisable to insulate basement/crawl space from exterior using rigid extruded polystyrene board down to approx. 0.3m below grade and out approx. 1.0m from foundation wall: less difficult to construct and would offer some protection to fragile foundation. use of rigid exterior sheeting as proposed would have to be accompanied by extremely successful air sealing work to prevent possibility of moisture damage within walls: use of breathable materials probably preferable. topping up of existing wall cavity contents would be a reasonable first step for any type of wall retrofit. air/vapour barrier would be a necessary part of a ceiling reinsulation project, particularly in the dropped ceiling area.

FILE # ED109

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920 (est.)
Style:	2 storey
Wall type:	wood frame, asphalt-coated fibrous siding
Basement type:	full, concrete
Floor area:	107 square metres above grade, 51 square metres in basement
Interior volume:	380 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	mid-1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	54 square metres, approx. 50% with 25mm wood shavings and 50% uninsulated. 2nd level ceiling constructed of painted tongue-and-groove boards, attic above is unvented to exterior, roof is board sheathing with asphalt shingles. relatively low air leakage through entire ceiling/roof assembly: only slight frost buildup in winter.
Main walls:	sheathed both sides, hardboard or drywall interior finish, 89-100mm cavities filled with wood shavings.
Basement:	full beamfill, 0.7m above grade, 29m perimeter uninsulated full depth. 8 square metre cistern partially full and open to basement: water supply is hauled in.
Doors:	1 @ wood with aluminum storm door opening to unheated porch. 1 @ wood with wood storm door. 1 @ wood with wood storm door on upper level closed off and insulated.
Windows:	all DG, mostly single-hung wood type with wood or metal storms, one wood casement with metal storm, two DG vinyl sliders.
Air change:	0.40 ac/h natural, no exhaust fans, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace, approx. 16 years old, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 24 C all day on upper levels, winter basement temp. approx. 18 C.
Humidity:	low to medium in winter, minor window fogging, no humidifier, dryer vented outside.
Remarks:	originally rural residence, now at city periphery.

ENERGY RETROFIT

Initial Proposal:	seal, caulk doors, 20% of windows, basement, incl. dryer vent, sump pump outlet (doors already weatherstripped, windows 80% caulked). remove old siding, strap wall with 38X89mm framing spaced out to allow RSI 3.5 glass fibre batts, finish with masonite siding. apply new vapour barrier from interior, cover with new drywall. ceiling to be insulated to RSI 7.0 with glass fibre batts. replace furnace with energy-efficient type (spark ignit./power vent damper).
Audit Findings:	proposed work would be accompanied by installation of new pressure-treated wood, insulated foundation walls to replace existing foundation walls which have deteriorated structurally; an addition is planned for the main floor. proposed costs probably reasonable for energy conservation portion because of renovation component of replacing exterior and interior finishes. interior vapour barrier application could be deleted and added to exterior wall work if sufficient insulation levels added to existing; this would result in interior work being purely renovation. exterior wall work would be straightforward, and with homeowners supplying the labour, would be cost effective. homeowners unable to fund their portion of the project in 1983.

FILE # ED125

GENERAL DATA

Location:	Tyndall
Vintage:	pre-1920 (est.)
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding (shakes)
Basement type:	partial, concrete-lined dugout, crawlspace elsewhere, perim. rubble footing
Floor area:	57 square metres above grade, 14 square metres in basement
Interior volume:	314 cubic metres
Heating system:	electric, baseboard heaters
Occupants:	4
Occupancy:	October 1979
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	horizontal and pitched portions: approx. 125mm blown-in loosefill cellulose fibre, 2 gable vents.
Main walls:	shiplap sheathing, plywood and chipboard interior finish, approx. 100mm cavities filled with blown-in loosefill cellulose fibre.
Basement:	0.5m above grade, header uninsulated, log floor joists and beams, stability questionable. 28m perimeter: 0.9m high crawl space with earthen floor surrounds 2.4m deep dugout area, entire perimeter uninsulated.
Doors:	2 @ 50mm panel wood doors with wood storm doors, one entry being sealed off and insulated with RSI 3.5 batts in winter.
Windows:	9 SG single-hung wood types with 2nd storm panes in winter, 1 TG vinyl slider.
Air change:	approx. 0.7 ac/h natural (test conditions windy), no exhaust fans or fresh air intake.
Heating equipment:	electric baseboard heaters, interior chimney sealed off.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 21 C, 56 h/wk @ 19 C; winter basement temp. approx. 16 C.
Humidity:	winter levels low, humidifier used, no window condensation, dryer vented outdoors.
Remarks:	small old house which has recently undergone interior refinishing and some insulating; access holes to cavities from interior of house poorly patched, allowing possible passage of air and moisture into wall and ceiling systems.

ENERGY RETROFIT

Initial Proposal:	seal, weatherstrip one window, replace 6 others with TG units. replace 2 doors and convert living room window into a door. single wall retrofit, incl. strip siding, sheet with 38mm rigid extruded polystyrene board, and apply new siding. insulate exterior perimeter of foundation with rigid extruded polystyrene to below grade.
Audit Findings:	windows, doors, exterior wall work accompanied by very long expected simple payback periods because resulting energy saving would be relatively small. exterior foundation insulation would be the most cost effective measure to implement, with expected payback from energy saving of approx. 4 years, but total annual saving insufficient to meet programme requirement; foundation stability would have to be investigated. a combination of the above could be expected to save approx. 33% of annual consumption with approx. 22 year payback.

FILE # ED158

GENERAL DATA

Location:	Winnipeg
Vintage:	1920 (est.)
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding
Basement type:	full, concrete, with crawl space under rear kitchen addition
Floor area:	104 square metres above grade, 34 square metres in basement
Interior volume:	348 cubic metres
Heating system:	natural gas, forced air
Occupants:	3
Occupancy:	1973
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	cathedral ceiling of bedroom added above kitchen, its adjacent riser wall to attic, and deck over kitchen: approx. RSI 5.3-5.6 in glass fibre batts. main attic: RSI 7.0 blown cellulose. pitched portions of orig. house: 100mm blown cellulose between rafters.
Main walls:	side walls of rear kitchen addition: 38X89mm framing with wood shavings. end wall of kitchen and all walls of bedroom addition: 38X140mm framing with RSI 3.5 glass fibre batts. all exterior walls of original house: 50X100mm framing and cavities filled with UFFI.
Basement:	1.1m above grade, joists and header on top of railway timber plate on top of concrete wall: header area insulated with RSI 3.5 glass fibre batts plus drywall. 24m perimeter: 6m with 38X140mm framing and RSI 3.5 glass fibre batts, 18m uninsulated. large openings from basement to crawl space under kitchen. kitchen floor insulated with glass fibre batts to approx. RSI 4.9.
Doors:	2 @ wood with wood storm doors. 1 TG patio door set in kitchen addition.
Windows:	all DG except TG patio doors and bedroom skylight; mixture of D[illegible] fixed units (12mm spacing), large fixed/casement type in bedroom addition, and DG aluminum vertical sliders.
Air change:	0.60 ac/h natural (estimate reduced from test results because of some kitchen renovation work in progress), no exhaust fans or fresh air intake to return air duct.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 18 C; approx. winter basement temp. 17 C.
Humidity:	winter levels low, no humidifier.
Remarks:	homeowners have done and are doing significant renovation work.

ENERGY RETROFIT

Initial Proposal:	minor caulking. replace both inner and storm doors at rear entrance. insulate basement walls. exterior wall retrofit. perhaps air-to-air heat exchanger.
Audit Findings:	air seal and basement insulation are high priority and cost effective. doors, exterior wall work, heat exchanger inappropriate at this time. furnace replacement with high efficiency type, along with tightening and basement upgrading would result in retrofit project meeting programme requirement for energy saving, and at acceptable cost with homeowner labour component. application subsequently withdrawn from programme.

FILE # ED179

GENERAL DATA

Location:	Swan River
Vintage:	1921
Style:	2 storey
Wall type:	wood frame, asphalt-coated fibreboard siding
Basement type:	full, concrete
Floor area:	147 square metres above grade, 79 square metres in basement
Interior volume:	587 cubic metres
Heating system:	oil, forced air
Occupants:	I
Occupancy:	pre-1965
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	150mm blown-in rock wool in spaces between 2nd level ceiling and attic floorboards (attic used for storage).
Main walls:	empty approx. 100mm wall cavities with lath and plaster interior finish, shiplap sheathing, and simulated brick siding.
Basement:	partial beamfill, 0.8m above grade. 37m perimeter: header areas and basement wall covered with 25mm rigid expanded polystyrene down to 0.6m below bottom of joists, remainder of wall height uninsulated; cistern occupies 10 square metres of floor.
Doors:	2 @ 44mm wood with wood storm doors. 2 @ 38mm wood doors, one with wood storm opening to balcony, the other with aluminum storm.
Windows:	2 DG vinyl sliders, 15 DG single-hung types with wood storms, 1 SG single-hung unit.
Air change:	0.71 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	oil furnace (installed 1965), assumed seasonal efficiency 0.65, interior chimney; occasional use of basement wood stove.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 15.5; winter basement temp. approx. 19 C.
Humidity:	winter levels low, no condensation on windows, humidifier used, dryer vented indoors.
Remarks:	excellent potential for large energy saving through energy-conservation retrofit work; actually 2½ storey house with upper ½ storey not part of living space; 60 amp electrical service.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors and windows. add storm to SG window and repair other storms as required. replace 2 wood storm doors with aluminum type. sheet exterior walls with 38mm rigid extruded polystyrene board and apply vinyl siding. frame, insulate to RSI 3.5 with glass fibre batts, drywall basement walls except for cistern area which would be done on exterior. insulate stairwell and weatherstrip/insulate door to attic. convert 2 incandescent lights to fluorescent type.
Audit Findings:	as wall cavities empty it is more appropriate to apply blown-in insulation than to use rigid insulation; cost would be lower. a complete air leakage sealing and basement insulation are high priorities. door and window components are minor compared to the above, but could be included in a retrofit project because of the cost effectiveness of the major components. conversion to electric heating from oil is also a very favourable measure. homeowner funded retrofit project of own design outside the programme.

FILE # ED191

GENERAL DATA

Location:	Dauphin
Vintage:	1909
Style:	2 storey
Wall type:	wood frame, stucco over wood siding
Basement type:	full, concrete
Floor area:	169 square metres above grade, 78 square metres in basement
Interior volume:	626 cubic metres
Heating system:	oil, forced air
Occupants:	2
Occupancy:	longer than 20 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	54 square metres: 140mm blown-in rock wool between joists, under attic floor boards. 30 square metres: 140mm blown-in rock wool under floor boards plus 165mm loosefill cellulose fibre.
Main walls:	shiplap sheathing, lath and plaster interior finish, approx. 100mm wall cavities filled with blown-in rock wool.
Basement:	joists, headers on top of foundation, 0.9m above grade. 40m perimeter: uninsulated, except walls covered with chipboard.
Doors:	2 @ wood doors, one with wood storm, one opening to enclosed porch.
Windows:	all DG, mixture of sealed units (12mm spacing) and single-hung types with storms totalling 16 square metres of glazed area.
Air change:	0.17 ac/h natural, kitchen and bathroom exhaust fans, no fresh air intake to return air duct.
Heating equipment:	2 oil furnaces, more than 25 years old, assumed seasonal efficiency 0.65, interior chimneys; supplementary electric heater in bedroom; fireplace.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 21 C, 56 h/wk @ 18 C; winter basement temp. approx. 18 C.
Humidity:	winter levels low to moderate, evidence of mould growth in basement (likely damp in summer), minor window condensation, humidifier on furnace and portables both used.
Remarks:	heat distribution system performance has been poor in the past with water pipes on the north wall freezing up.

ENERGY RETROFIT

Initial Proposal:	caulk windows, weatherstrip doors, block air leakage to 2nd floor bedroom floor system. replace 2 windows with TG units. add aluminum storm door to single wood door which opens to porch. frame and insulate basement walls to RSI 2.1 level and reinstall chipboard. apply polyethylene vapour barrier to attic floor, add 150mm rigid expanded polystyrene board, then cover with aspenite. replace 2 oil furnaces with 2 conventional natural gas units. replace electric DHW tank with natural gas type.
Audit Findings:	makes sense to convert to one or more higher-efficiency gas furnaces, but it may also be easier to install 2 smaller electric furnaces without much modification of distribution system. little cost difference to insulate basement to RSI 3.5 instead of RSI 2.1. rigid insulation is expensive material to use for ceiling upgrading, so only the minimum area required for storage should be done this way; in other areas glass fibre batts, for example, would be easy to install. electric DHW tank in good condition but needs to be insulated; likely no significant change in energy cost to the homeowner would result from conversion to natural gas DHW tank. window and door upgrading is low priority. house tight for age (likely due to newer stucco exterior finish): air sealing work should be undertaken along with any major upgrading project in order to protect investment from potential moisture problems; with large house and current occupants, humidity problems unlikely, however. homeowner lost interest in the programme.

FILE # ED218

GENERAL DATA

Location:	La Broquerie
Vintage:	1900 (est.)
Style:	2 storey
Wall type:	wood frame, wood siding
Basement type:	crawl space, stone and mortar (portion dug out with rubble retaining wall)
Floor area:	119 square metres above grade, 18 square metres in basement
Interior volume:	363 cubic metres
Heating system:	electric, baseboard
Occupants:	6
Occupancy:	likely longer than 10 years
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings plus 300mm blown-in loosefill glass fibre; 2 roof vents.
Main walls:	2 layers of shiplap each side, fibreboard interior finish, empty wall cavities suspected but not confirmed.
Basement:	0.1m above grade, log joists and beams: structurally sound, access by hatch. 28m perimeter: 24m is 0.5m high crawl space with earthen floor, and is insulated with 2 layers of RSI 3.5 glass fibre batts: all but 4m has an additional 50mm of rigid expanded polystyrene board; 4m of full-height wall insulated with 2 layers of RSI 3.5 batts: all but 1m has the extra 50mm rigid expanded polystyrene board (all in fall 1982).
Doors:	2 @ wood doors, one only with wood storm door.
Windows:	all DG single-hung types with wood storms except 3 DG horizontal sliders; one storm missing.
Air change:	1.05 ac/h natural, bathroom exhaust fan.
Heating equipment:	electric baseboard heaters, interior chimney blocked off when conversion took place.
Domestic hot water:	electric.
Temp. settings:	168 h/wk @ 20 C; basement unheated and cool in winter.
Humidity:	winter levels low, window condensation frequent, no humidifier, dryer vented outdoors.
Remarks:	well-maintained old farm house, uncertainty as to contents of wall cavities.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors, windows, wall outlets, etc. replace all single-hung type windows. replace entrance doors. sheet walls with rigid-type insulation and apply new siding.
Audit Findings:	simulation suggested wall cavities indeed empty: if so, suggested to blow in loosefill glass fibre insulation. extensive air leakage sealing to entire house is suggested to reduce high convective heat loss. basement is very leaky to air: suggest exterior rigid insulation near ground as a means of preventing air leakage under the house. an interesting case, but homeowners lost interest in the programme.

FILE # ED224

GENERAL DATA

Location:	Winnipeg
Vintage:	1928
Style:	one and three-quarter storey
Wall type:	wood frame, stucco
Basement type:	full, concrete
Floor area:	116 square metres above grade, 55 square metres in basement
Interior volume:	425 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1971
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	140mm shavings between joists, attic ventilation minimal, previously the rafters were insulated and this was knocked down onto the ceiling. pitched portions: rafter spaces filled with wood shavings.
Main walls:	approx. 140mm cavities insulated with wood shavings, possibly some settling, shiplap sheathing both sides.
Basement:	full beamfill, 0.9m above grade, brick finish on exterior above grade. 30m perimeter: 18m with 38X64mm framing and panelling with compressed RSI 2.1 glass fibre batts, 4m is a closed-in storage room, and 8m is poorly insulated portion in laundry room.
Doors:	2 @ wood with wood storm doors.
Windows:	all DG single-hung or casement type with wood or aluminum storms.
Air change:	0.52 ac/h natural, passive bathroom vent, fresh air intake to return air duct open fireplace with functional damper.
Heating equipment:	conventional natural gas furnace approx. 10 years old, assumed seasonal efficiency 0.65, interior chimney; supplementary electric heaters in basement (two 1.5 kW units from mid-Dec to late-Feb, otherwise one 1.5 kW unit used).
Domestic hot water:	natural gas.
Temp. settings:	20 C all the time; winter basement temp. approx. 20 C with electric heaters.
Humidity:	low to medium winter levels, low moisture production because homeowners travel much of the time, humidifier used and adjusted according to level of window-fogging.
Remarks:	electricity used for air conditioning and for heating of detached greenhouse.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. replace kitchen window with TG unit, add storms to 4 other rooms. replace one door with steel, insulated type. strip siding from one wall (south) above grade, add 50 or 75mm rigid extruded polystyrene board, reapply siding. reinsulate laundry room in basement with 50mm extruded polystyrene, drywall. upgrade attic insulation with blown loosefill glass fibre to RSI 7.0 level, then install ventilation and tighten attic hatch. other: setback thermostat, fireplace doors, fireplace flue damper.
Audit Findings:	wall retrofit unnecessary. airtightness improvement high priority. basement and attic upgrading would not have major effect on energy demand because those areas already moderately well insulated. insufficient potential to meet programme requirement for energy saving at reasonable cost.

FILE # ED225

GENERAL DATA

Location:	Winnipeg
Vintage:	1920 (est.)
Style:	2 storey
Wall type:	wood frame, asphalt-coated fibrous siding
Basement type:	full, stone and mortar
Floor area:	124 square metres above grade, 54 square metres in basement
Interior volume:	467 cubic metres
Heating system:	oil, gravity hot water
Occupants:	4
Occupancy:	January 1983
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	100mm wood shavings, 2 roof vents.
Main walls:	approx. 140mm cavities filled with wood shavings.
Basement:	partial beamfill, 1.0m above grade. 33m perimeter: uninsulated.
Doors:	2 @ wood with aluminum storm doors.
Windows:	all DG single-hung, casement, awning types with aluminum storms.
Air change:	0.40 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	old oil-fired boiler, assumed seasonal efficiency 0.60, interior chimney.
Domestic hot water:	electric.
Temp. settings:	approx. 112 h/wk @ 20.5 C, 56 h/wk @ 18 C; winter basement temp. approx. 10 C; settings by previous occupants unknown.
Humidity:	winter levels medium, no humidifier, dryer vented outdoors.
Remarks:	old house ideal for energy conservation demonstration retrofit.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. close off several windows on north wall and in basement with shutters. replace one door with steel, insulated type. insulate basement from interior to RSI 3.5 with glass fibre batts, drywall. seal ceiling and add RSI 7.0 blown loosefill glass fibre to attic. replace oil-fired boiler with electric boiler incl. upgrade service.
Audit Findings:	air seal, basement, attic, boiler conversion all cost effective measures. other proposed components to be considered as renovations. homeowners subsequently transferred out of province for two years, therefore unable to participate in programme.

FILE # ED230

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	one and three-quarter storey
Wall type:	wood frame, wood siding
Basement type:	half full, concrete; half crawl space with house on pads and posts
Floor area:	151 square metres above grade, 44 square metres in basement
Interior volume:	516 cubic metres
Heating system:	natural gas, forced air
Occupants:	2
Occupancy:	1975
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic: 100mm wood shavings between joists plus RSI 2.1 glass fibre batts over top. pitched portions: 100mm wood shavings between rafters.
Main walls:	shiplap sheathing both sides, 100mm cavities filled with wood shavings.
Basement:	main floor 1.0m above grade; crawl space is under 37% of main floor area and is 1.0m high, 17m perimeter wall insulated with RSI 2.1 glass fibre batts to grade and floor above is insulated with RSI 3.5 glass fibre batts. full-height portion of basement: 23m perimeter uninsulated except for 9m with 38X64mm strapping laid flat, 38mm glass fibre batts and panelling; basement window openings filled with glass fibre batts between panes.
Doors:	2 @ wood opening to enclosed porches.
Windows:	all DG single-hung and casement types with wood storms.
Air change:	0.89 ac/h natural, bathroom exhaust fan, no fresh air intake to return air duct.
Heating equipment:	conventional gas furnace approx. 16 years old, assumed seasonal efficiency 0.65, interior chimney; airtight-type wood stove, not used much.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 18 C, 56 h/wk @ 15 C; approx. winter basement temp. 14 C.
Humidity:	low to medium winter levels, humidifier used.
Remarks:	crawl space exterior wall merely a skirt with high air leakage; 2nd level walls and ceiling have many penetrations of envelope.

ENERGY RETROFIT

Initial Proposal:	air seal not proposed: had been done previously! replace one door with steel, insulated type. replace 8 windows with TG units. partial double-wall retrofit from 0.5m below grade to 1.5m above grade, including 6 mil polyethylene vapour barrier, 38X89mm framing, RSI 5.6 glass fibre insulation, plywood sheathing, stucco.
Audit Findings:	unreasonable to attempt air seal until large openings in building envelope are closed off. partial double-wall retrofit alone insufficient to meet programme requirement for energy saving, although expected simple payback period would be just over 10 years because of lower labour costs accompanying the work which could all be done from ground level. replacement of furnace with high-efficiency type as part of project would improve total energy savings significantly. proposal subsequently withdrawn.

NOTES:

D.2.4 2½ Storey Houses

Pre-1945:	ED 058	Winnipeg
	ED 102	Treherne
	ED 162	Winnipeg
	ED 239	Winnipeg

FILE # ED058

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920
Style:	2½ storey
Wall type:	wood frame and brick
Basement type:	full, stone and mortar
Floor area:	166 square metres above grade, 60 square metres in basement
Interior volume:	574 cubic metres
Heating system:	natural gas, hot water
Occupants:	2
Occupancy:	November 1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central and side attics: (inaccessible) reported blown cellulose and wood shavings to RSI 7.0 total. pitched portion: 100mm wood shavings between rafters. kneewalls: (inaccessible) assumed 100mm wood shavings between studs.
Main walls:	100mm brick on exterior with approx. 89mm cavities uninsulated.
Basement:	partial beamfill, 1.1m above grade. 33m perimeter: 5m insulated full depth with RSI 2.1 glass fibre, 28m uninsulated.
Doors:	2 @ wood with wood storm doors opening to outdoors or screened porch. 1 @ wood opening to enclosed porch.
Windows:	all DG, single-hung type with a mixture of wood and metal storms.
Air change:	0.8 ac/h (estimated - unable to achieve standard pressure differentials due to leakiness and volume of house).
Heating equipment:	gas boiler conversion from coal unit, 50+ years old, assumed seasonal efficiency 0.60, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	19 C all the time; winter basement temp. less than 17 C.
Humidity:	very low in winter, no humidifier.
Remarks:	large, old house, poorly insulated and leaky: potential for energy saving through upgrading is high.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house, esp. around window, door openings. replace all windows with DG or TG. replace all doors with insulated type. repair cracks in brick, insulate stud cavities from interior, add vapour barrier and drywall, incl. eliminating some unnecessary windows. insulate basement walls with 50-75mm rigid extruded polystyrene. replace hot water radiators on 2nd and 3rd levels with electric baseboard heaters. other: insulate water lines and DHW tank, install car plug timer.
Audit Findings:	proposal probably optimistic in relation to programme retrofit budget limit because no cost estimates provided, unless with substantial homeowner-labour component. insulate basement to RSI 3.5 with glass fibre. entire package less radiator replacement later estimated at approx. $10,000 with substantial portion of labour provided by homeowners: expected simple payback period approx. 10 years. homeowners unable to schedule completion of proposed retrofit work within the period of the programme.

FILE # ED102

GENERAL DATA

Location:	Treherne
Vintage:	1921
Style:	2½ storey with 1 storey addition on slab
Wall type:	wood frame, wood siding
Basement type:	full, concrete, plus slab addition
Floor area:	183 square metres above grade, 78 square metres in basement
Interior volume:	676 cubic metres
Heating system:	electric, baseboard
Occupants:	5
Occupancy:	March 1975
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	2 layers of RSI 3.5 glass fibre batts.
Main walls:	double shiplap with cavities filled with wood shavings on 3 walls and with loosefill cellulose fibre on 1 side. addition: 38X89mm framing with RSI 1.4 glass fibre batts.
Basement:	full beamfill, 0.9m above grade, header areas insulated with RSI 3.5 batts. 35m perimeter: 15m with 38X89mm framing and RSI 2.1 batts, 8m with 38X89mm framing and 2 layers of RSI 2.1 batts, 9m with 38X89mm framing and 1 layer of RSI 1.4 batts plus 1 layer of RSI 2.1 batts, 3m uninsulated, all but 15m of insulated portion panelled.
Doors:	5 @ wood doors, 3 with wood storm doors. 1 @ steel, insulated door.
Windows:	5 TG wood type, 2 of which are sealed units, 3 are casements. 7 DG wood combination sealed/awning type. 9 DG single-hung type with wood storms.
Air change:	0.35 ac/h natural, bathroom exhaust fan, no fresh air intake.
Heating equipment:	electric baseboard heaters, no chimney.
Domestic hot water:	electric.
Temp. settings:	112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 16 C.
Humidity:	low to medium winter levels, minimal window condensation, dryer vented outdoors.
Remarks:	well-insulated older house with little potential for major energy-conservation upgrading.

ENERGY RETROFIT

Initial Proposal:	seal and weatherstrip doors, windows. replace 5 single-hung units and storm windows with TG units. replace 3 wood doors with steel, insulated type. double-wall retrofit, adding 38X89mm framing and nominal RSI 5.6 glass fibre batts to existing wall. insulate portion of exterior basement wall with RSI 2.1 glass fibre batts. apply vapour barrier to attic (actually floor of 3rd level) and boost thermal resistance by adding a 2nd layer of RSI 3.5 glass fibre batts.
Audit Findings:	air sealing work, upgrading attic, and finishing insulation of the basement are practical priorities for this house. because of high levels of insulation overall in the house, only approx. 20% of current annual energy consumption can be saved with implementation of all the proposed measures, and with an expected simple payback period of approx. 27 years despite the low proposed cost of labour (homeowner to provide much of the labour).

FILE # ED162

GENERAL DATA

Location:	Winnipeg
Vintage:	pre-1920 (est.)
Style:	2½ storey
Wall type:	concrete blocks, stucco
Basement type:	full, concrete blocks
Floor area:	153 square metres above grade, 61 square metres in basement
Interior volume:	525 cubic metres
Heating system:	natural gas, forced air
Occupants:	6
Occupancy:	1980
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	central attic and ceiling over dormers: drywall and RSI 4.9 glass fibre batts. pitched portions: 150mm rigid expanded polystyrene board and drywall. kneewalls: drywall and RSI 4.9 glass fibre batts. side attic floors: 300-350mm blown cellulose over floorboards, and rigid expanded polystyrene board fitted between joists at outer wall.
Main walls:	250mm concrete blocks, air spaces both sides, stucco on exterior, lath and plaster on interior.
Basement:	partial beamfill, 0.7m above grade, header areas insulated with 150mm rigid expanded polystyrene board. 31m perimeter: 25m framed and insulated with RSI 3.5 glass fibre batts, 6m uninsulated. 20 square metres of floor slab insulated with 50mm rigid extruded polystyrene board and covered with 19mm plywood.
Doors:	2 @ wood with wood storm doors. 1 @ wood with wood storm door, with two-thirds of intervening air space filled with RSI 3.5 batts (opens to 2nd floor porch).
Windows:	most except basement windows upgraded to modern DG or TG fixed, awning, and casement types.
Air change:	0.85 ac/h natural, dryer on 2nd level vented outside, fresh air intake to return air duct.
Heating equipment:	older conventional gas furnace, assumed seasonal efficiency 0.65, interior chimney.
Domestic hot water:	natural gas.
Temp. settings:	previously approx. 112 h/wk @ 19 C, 56 h/wk @ 17 C; currently 20.5 C and 19 C, respectively; winter basement temp. approx. 16 C.
Humidity:	winter levels low, humidifier used.
Remarks:	an unusual foundation and wall construction for the region; the thermal mass could be well utilized with exterior insulation.

ENERGY RETROFIT

Initial Proposal:	double wall retrofit including exterior 6 mil polyethylene vapour barrier, 38X89mm framing, RSI 5.6 in glass fibre batts, plywood sheathing, stucco (homeowner would strip existing stucco from house).
Audit Findings:	proposed work would result in sufficient expected energy saving to meet programme requirement, but cost could not be brought down to less than limit allowed under the programme, mainly because of area to be retrofitted and difficulty in dealing with existing structure.

FILE # ED239

GENERAL DATA

Location:	Winnipeg
Vintage:	1920 (est.)
Style:	2½ storey
Wall type:	wood frame, wood siding
Basement type:	full, stone and mortar
Floor area:	156 square metres above grade, 54 square metres in basement
Interior volume:	534 cubic metres
Heating system:	natural gas, forced hot water
Occupants:	5
Occupancy:	1977
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	assumed approx. 75mm wood shavings average - no access.
Main walls:	shiplap sheathing both sides, approx. 100mm cavities filled with wood shavings, likely some settling has occurred.
Basement:	partial beamfill, 1.05m above grade, header area uninsulated. 32m perimeter: 17m framed and insulated with RSI 2.1 glass fibre batts and panelling, 15m uninsulated.
Doors:	2 @ wood with wood storm doors. 1 @ single wood door.
Windows:	mostly DG single-hung or fixed types with wood or aluminum storms, except storms missing on two 3rd level windows.
Air change:	0.49 ac/h natural, no exhaust fans or fresh air intake to return air duct.
Heating equipment:	10 year old gas boiler, assumed seasonal efficiency 0.65, exterior chimney; fireplace.
Domestic hot water:	natural gas.
Temp. settings:	approx. 112 h/wk @ 20 C, 56 h/wk @ 17 C; winter basement temp. approx. 18 C.
Humidity:	low winter levels, pans of water used for humidification.
Remarks:	good condition for the vintage.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip entire house. rebuild 3rd level envelope with RSI 7.0 on horizontal surfaces, RSI 5.6 on pitched portions, kneewalls to RSI 3.5, 6 mil polyethylene vapour barrier, and drywall. partial double-wall retrofit from 0.5m below grade to 1.5m above grade, including 6 mil vapour barrier, 38X89mm framing, RSI 5.6 glass fibre batts, plywood sheathing, stucco.
Audit Findings:	energy saving from proposed retrofit work not quite enough to meet programme requirement, and cost is unacceptably high.

NOTES:

D.2.5 Split-level Houses

1945-70:	ED 005	Winnipeg
	ED 117	Winnipeg

FILE # ED005

GENERAL DATA

Location:	Winnipeg
Vintage:	1965 (est.)
Style:	4-level split
Wall type:	wood frame, stucco and brick finish
Basement type:	full, concrete; heated crawl space on one side of split
Floor area:	170 square metres on all 4 developed levels above and below grade
Interior volume:	499 cubic metres including heated crawl space
Heating system:	natural gas, forced air
Occupants:	5 or 6
Occupancy:	April 1981
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	original 125mm wood shavings with RSI 4.2 (i.e., 2 @ RSI 2.1) glass fibre batts added in late 1982 or early 1983; adequate attic ventilation.
Main walls:	original RSI 1.4 glass fibre batts and UFFI with 38X89mm framing.
Basement:	0.6m above grade. lowest level: full beamfill with 18m perimeter insulated above and below grade with RSI 2.1 glass fibre batts and wood panelling. crawl space portion: 8m of perimeter insulated with RSI 1.2 glass fibre batts fastened to concrete, 6m of perimeter uninsulated.
Doors:	3 @ wood with metal storms and 1 wood door which opens to an attached garage
Windows:	all DG, narrow 6mm gap between panes.
Air change:	0.22 ac/h natural, bathroom exhaust fans.
Heating equipment:	original natural gas furnace, assumed seasonal efficiency 0.65, supplemental electric space heater in master bedroom over garage, exterior chimney.
Domestic hot water:	natural gas.
Temp. settings:	21 - 24 C most of the time.
Humidity:	medium to high moisture levels in winter due to relative tightness of structure and higher moisture production.
Remarks:	newer house in very good condition, occupants planning to remove UFFI from walls, reinsulate, add rigid insulating sheathing, and new siding.

ENERGY RETROFIT

Initial Proposal:	seal, caulk, weatherstrip doors, windows, crawl space. replace most windows with TG, add 3rd pane to living room picture window. remove existing wall insulation incl. UFFI, replace with RSI 2.1 glass fibre and 50mm rigid extruded polystyrene, then new siding.
Audit Findings:	home in very good condition. insufficient potential to meet programme requirement for energy savings at reasonable cost. wall insulation upgrade not justifiable on the basis of energy savings alone.

FILE # ED117

GENERAL DATA

Location:	Winnipeg
Vintage:	1965 (est.)
Style:	3-level split
Wall type:	wood frame, 70% stucco, 30% wood siding
Basement type:	full, concrete, including heated crawl space under one level of split
Floor area:	145 square metres on all 3 developed levels above and below grade
Interior volume:	404 cubic metres
Heating system:	wood supplemented with natural gas, forced air system
Occupants:	4
Occupancy:	March 1979
Project started:	-
Project completed:	-

PRE-PROJECT HOUSE

Ceilings:	51 square metre upper portion: 225mm of stacked glass fibre batts between joists. 46 square metre lower portion: 100mm wood shavings with 2 layers of RSI 2.1 glass fibre batts over top. short wall section between upper level of split and lower attic: 32mm rigid expanded polystyrene board plus RSI 1.4 glass fibre batts.
Main walls:	38X89mm framing with RSI 1.4 glass fibre batts.
Basement:	crawl space: full beamfill, 0.3m above grade, entire 19.5m perimeter and 1.4m height incl. header insulated with 32mm rigid expanded polystyrene board. lower level of split: full beamfill, 1.25m above grade, 22.5m perimeter: header insulated with RSI 1.4 glass fibre batts, 7m finished to floor with 32mm rigid expanded polystyrene board and drywall, 15.5m finished to floor with RSI 1.4 glass fibre batts, 38X64mm framing and panelling, except 89mm metal studs, RSI 2.1, and drywall near wood stove.
Doors:	1 @ wood with aluminum storm door. 1 @ wood with wood storm door.
Windows:	living room window upgraded to TG wood fixed/casement type, remainder DG alum. horizontal sliders almost all of which have interior 3rd glazing or both interior and exterior 3rd and 4th glazing.
Air change:	0.21 ac/h natural, continuously operating furnace fan with fresh air intake to return air duct adds approx. 0.25 ac/h forced, kitchen and bathroom exhaust fans.
Heating equipment:	wood stove in lower level of split, heat circulated via orig. heating system ductwork and continuous low-speed fan, assumed seasonal efficiency 0.5, exterior chimney; backup unit is orig. conventional natural gas furnace, used in early a.m. when fire low, interior chimney; combustion-air demand of wood stove causes some backdrafting through various openings.
Domestic hot water:	natural gas.
Temp. settings:	varies as stove stoked, usually greater than 21 C; backup heater thermostat set to 21 C; all levels warm.
Humidity:	medium winter levels, occasional dripping of exhaust fan, fresh air intake prior to wrapping with insulation and vapour barrier, dryer vented indoors.
Remarks:	energy-conscious homeowners with low nominal fuel cost.

ENERGY RETROFIT

Initial Proposal:	caulk upper level baseboards. modify kitchen exterior wall to RSI 4.2 with glass fibre/rigid isocyanurate board combination plus replace existing DG-plus-storm with TG bay unit, move door along wall. remainder of stuccoed portion of exterior walls to be upgraded to RSI 4.2 as above, by homeowner; new stucco by contractor.
Audit Findings:	cost effective to upgrade crawl space insulation by homeowner. unacceptable expected simple payback period for exterior wall retrofit, even with homeowner labour component. insufficient potential to meet programme requirement for energy saving at reasonable cost.

POOR
QUALITY
ORIGINAL